Post Office telecommunications journal

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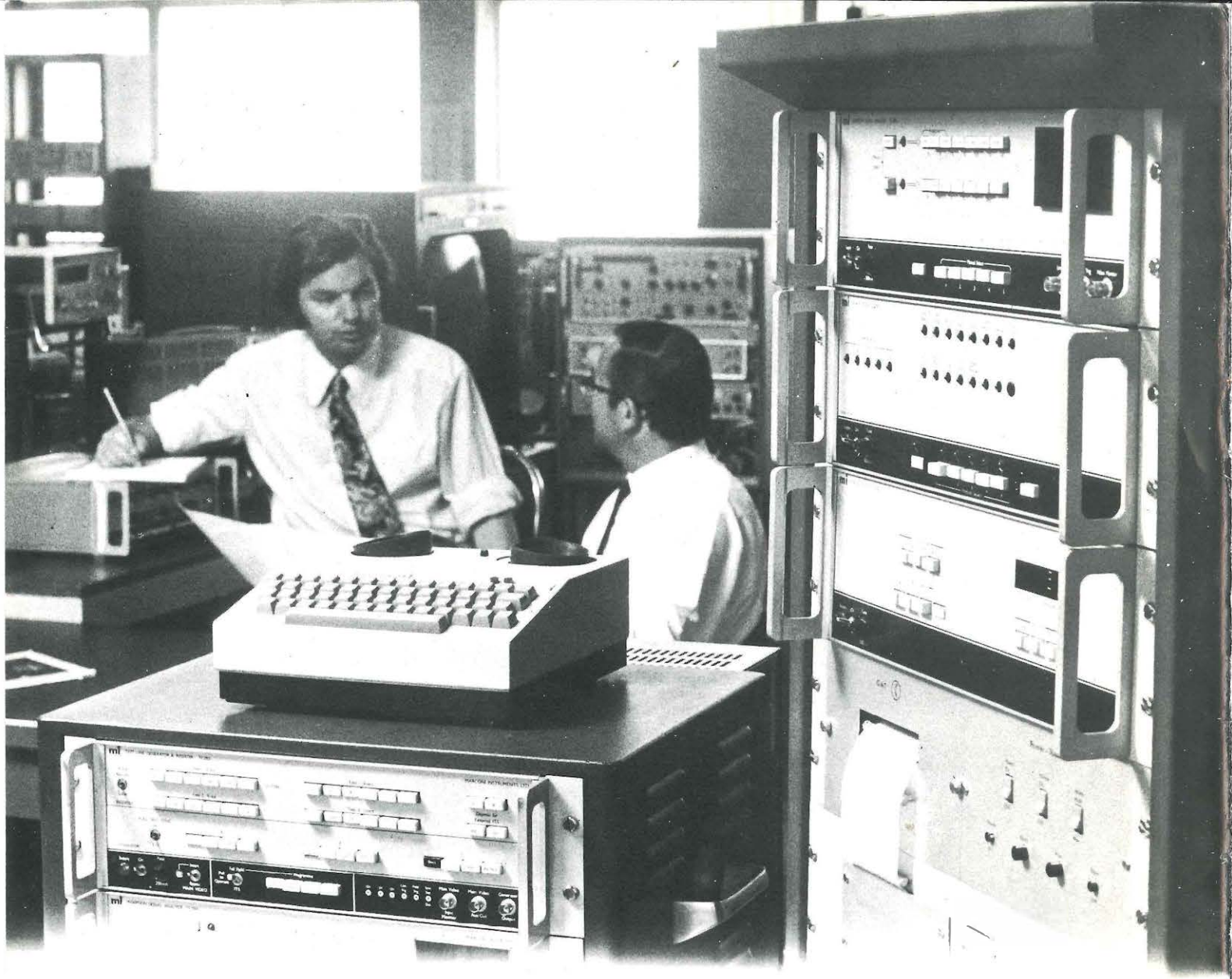

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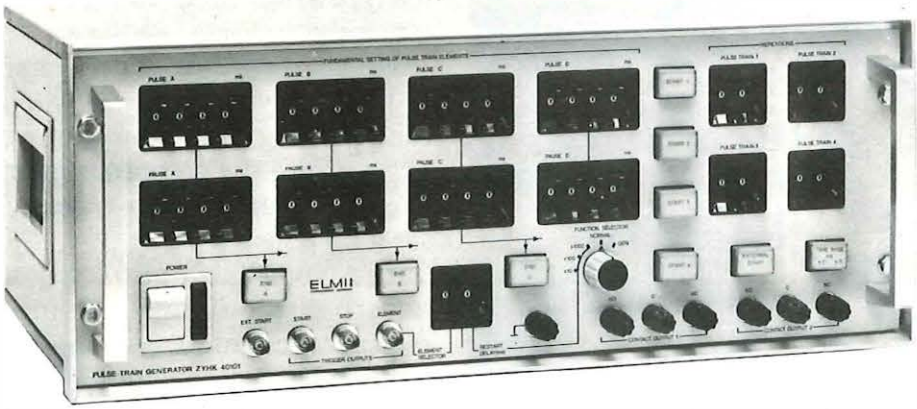

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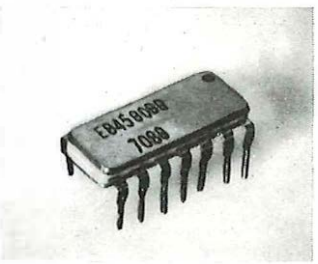

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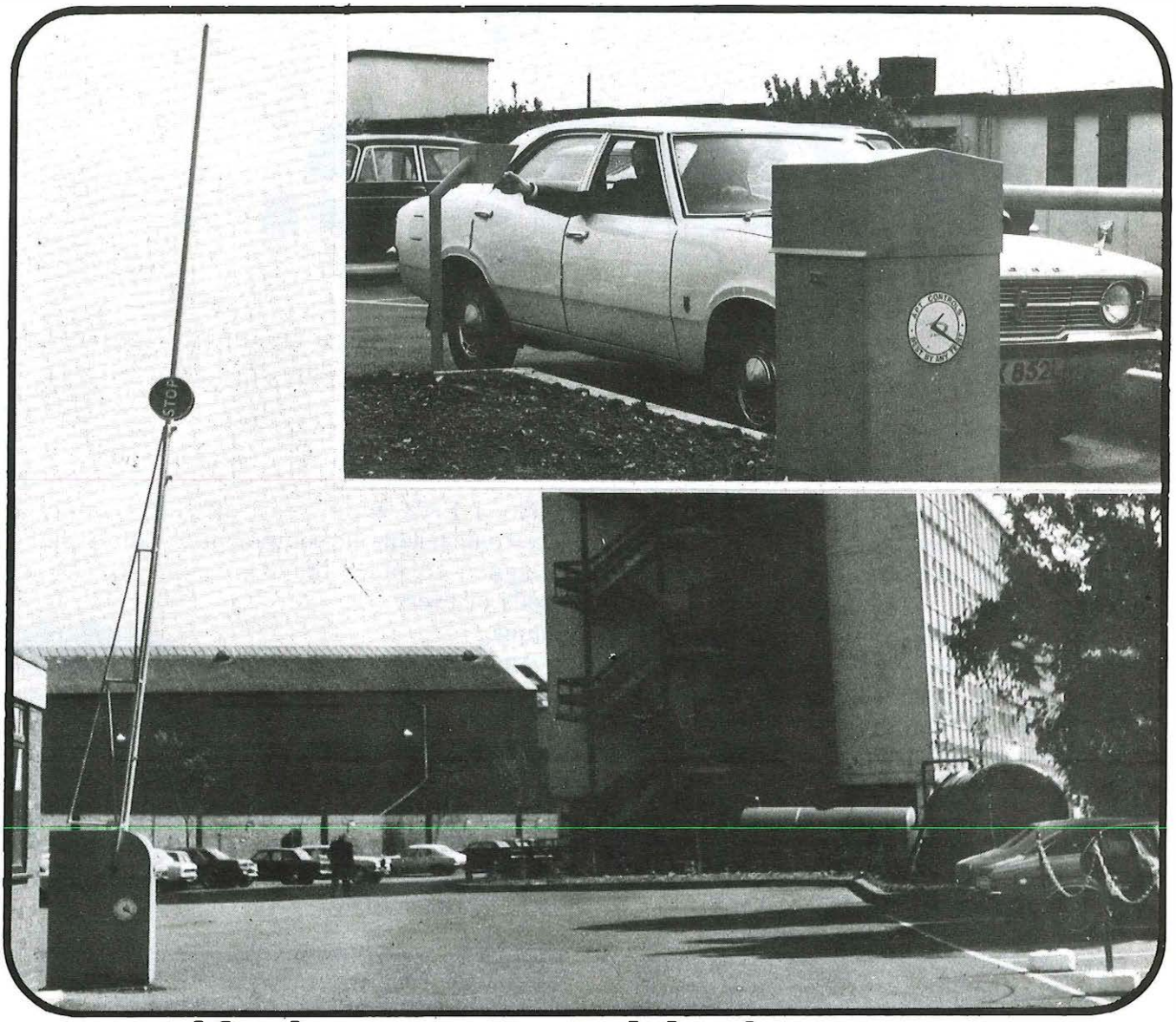

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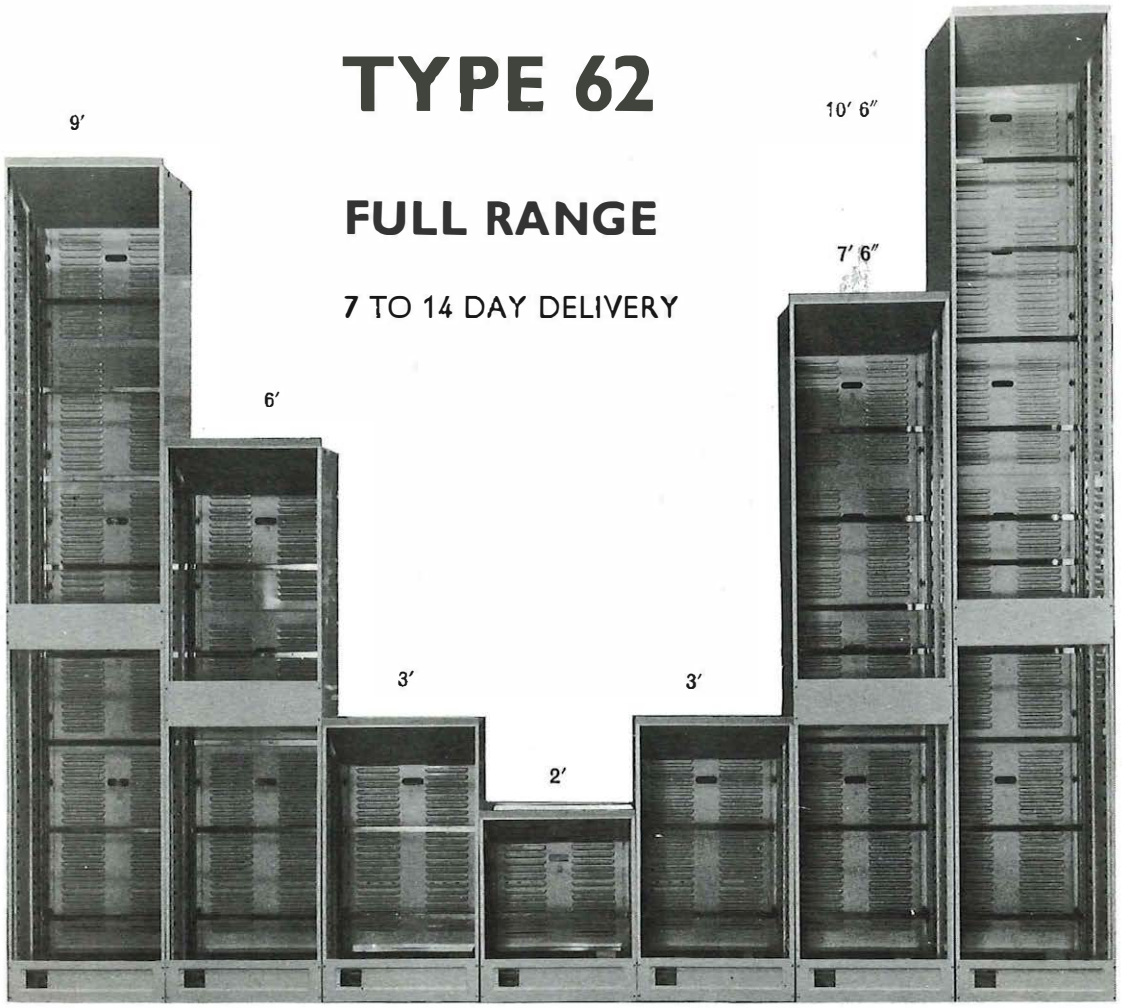

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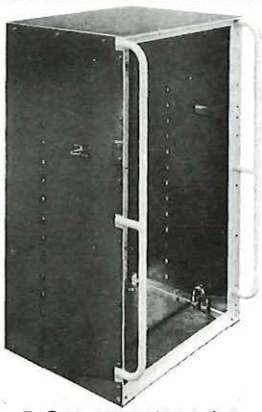

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Calling more men on the move

Plans to introduce a Post Office radiopaging service in London next year, announced recently, will be welcomed by thousands of people in different jobs who need to be easily contactable while on the move. Market research has shown that there is tremendous demand in the Greater London area for this method of communication – in which customers carrying a pocket-size "bleeper" can be alerted to take a prearranged course of action, such as telephoning their office.

The decision to bring radiopaging to a 900 square mile area of London follows the outstanding success of an experimental system which has operated in the Thames Valley since early 1973. Here some 1,800 pagers are now in use over an area of 800 square miles, with doctors, nurses, sales representatives and service engineers forming a major section of the customers. The new scheme in London will cater for 20,000 users initially, rising to a maximum of 100,000.

There is also the exciting prospect of an even wider radiopaging service in the future. Sir Edward Fennessy, Deputy Chairman of the Post Office and Managing Director Telecommunications, has stated that the London project could prove to be the first stage of a radiopaging programme which would eventually extend to most parts of the United Kingdom. Indeed, the Post Office is already examining the form a national service might take.

Pocket paging systems have, in fact, been commercially available in the UK since the mid-1950s, but they have been employed in confined areas such as hospital buildings, factories and offices. In contrast, the Post Office system enables any customer within an entire radiopaging area to be alerted by means of a telephone call from anywhere in Britain. For the London scheme the Post Office is also examining the possibility of providing pagers which give two clearly distinctive bleep tones. According to the tone received, the user would thus be able to identify and telephone one of two pre-arranged contact points.

A milestone – and an offer

Circulation of Telecommunications Journal has passed 50,000 copies per issue for the first time. To coincide with this notable milestone in our readership we are introducing a life subscription for Post Office pensioners. For a once-only payment of £4 retired staff can continue to receive regular copies of the Journal without having to renew their subscriptions each year. The offer is open to all existing Post Office pensioners and to other Post Office staff on retirement.

Post Office telecommunications journal

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Published by the Post Office of the United Kingdom to promote and extend knowledge of the operation and management of telecommunications

Cover: The Control Officer of a Dial-a-Bus service operating at Harlow, Essex, gives instructions to a driver. The Post Office's new Consultancy Service has assisted research into telephone equipment suitable for Dial-a-Ride schemes. (See page 4.)

The inter-city document service by phone

JE Briglin

THE POSTFAX service introduced on an experimental basis by the Post Office last October is Britain's first document facsimile transmission service for the public. Operating over the telephone network, it offers customers a fast means of sending documents between principal post offices in ten major cities.

In the past facsimile – the transmission and reproduction of an exact copy over a distance – has been confined to large companies and organisations which have their own transmission equipment. But Post Office market research revealed that there was a demand for a public service for use by small to medium sized companies – members of the legal profession, advertising agents, financial organisations and many other businesses.

With the Postfax service copies of documents taken to the selected post offices are normally in the hands of recipients within three hours. The customer simply hands in his document and completes a form. The facsimile is then transmitted to the receiving post office by a machine which can send printed text, maps, diagrams and drawings up to 14 inches by $8\frac{1}{2}$ inches in size. Photographs can also be handled, although quality of reproduction is reduced.

If a customer requests delivery and the recipient is within specified postal districts of the receiving office, the copy document is delivered by Post Office messenger. In cases where the copy is to be collected, the recipient is telephoned by the receiving post office.

Although Postfax is a Postal service the Telecommunications Business was actively involved in studies leading up to the trial and launching. Its principal role was in a technical advisory capacity on equipment and facilities, and an early task was to select the equipment. At present there are seven companies marketing document facsimile equipment in the United Kingdom. The machines generally all differ in quality of copy, amount of operator effort required and facilities, and all these had to be examined.

Market research undertaken by the Postal Business to identify potential users and their requirements provided a good idea of the type of machine needed. One item of note was an indication that the legal profession would be a heavy user of the service and that it required the capability for foolscap sized documents to be transmitted.

It was also determined that a more important marketing feature would be customer acceptability of the final facsimile copy. The choice was therefore narrowed to three machines employing three different types of printing process – electrostatic, electrothermal and electrolytic.

In the electrostatic process a stylus applies signal energy directly to specially coated paper, and an electrostatic image of the copy is produced. Carbon is applied to the signal charged paper where it clings to the electrostatic image, and it is then fused to the paper by heat. Electrothermal is known as the "burn-off" process, in which the top layer of carbon

A Postal Officer, left, prepares to transmit an original document by the Postfax service. At the distant receiving office, far right, an exact copy of the document is removed from the facsimile machine. To set up a Postfax call the transmitting office first makes contact with the receiving office. At a pre-arranged word both operators press a switch on line connector units which act as the interface between their facsimile machines and the telephone line. A high-pitched tone is given at both ends to indicate system readiness. The tone ceases when the document is inserted at the transmitting office and returns when transmission is completed. The operators then switch back to telephone contact to check that the copy has been successfully received.

laminated paper is spark-eroded by the recording stylus. The electrolytic process makes use of the discoloration produced on damp chemically treated paper when an electric current passes through it.

A series of pre-trial tests was carried out on the three different systems between London and Manchester. As well as enabling a final decision to be made on the choice of machine, the tests confirmed that the Postfax transmission requirements could be met by the public switched telephone network.

The tests consisted of transmitting original documents of varying quality and detail over the dialled-up network. Connections established were held until any one original had been transmitted using all machines in turn. This pattern was adopted to avoid any difference in quality of copy that could have arisen if different connections were used for different machines.

Judgment of the acceptability of copy quality was not made by the Post Office. The original documents transmitted in the tests and the actual received copies were used as a base for market research. This was carried out with potential customers identified by the earlier market research.

The equipment ultimately selected employs the electrostatic printing process and also satisfies the best combination of the particular requirements of the Postfax service. It not only came out well on customer acceptability of copy but could handle foolscap size documents and minimised operator time. The machine also had some specialised features that the Telecommunications Business wanted to try in the trial, including unattended answering of the telephone and automatic switching of the telephone line to the facsimile machine. This facility was to be used in certain situations where it could not always be guaranteed that staff would be near machines when incoming calls arrived.

The Telecommunications Business also liaised with the supplier of the machine on delivery details and on certain specialised Postal operational requirements. The last link in the equipment chain was, of course, to have the necessary telephones and card callmakers fitted at the selected post offices offering Postfax facilities.

Generally the offices are equipped with two machines, one for transmission and the other for reception, even though the machines are transceivers and can send and receive simultaneously. This apparent over-generous provision of equipment was necessary for operational reasons to provide a back-up while the system was tested.

Documents to be transmitted are received from customers at counters by Postal staff who also collect the revenue. To avoid double handling of documents, the transmitting machines are located nearby and are operated by counter clerks. For convenience, too, the receiving machines are generally located in or near telegraph rooms. Telegraphists therefore usually deal with incoming messages and these are delivered by the normal telegram delivery force. This involvement of Telecommunications field staff with Postfax necessitates details of staff hours employed to be recorded so that Posts can be billed accordingly.

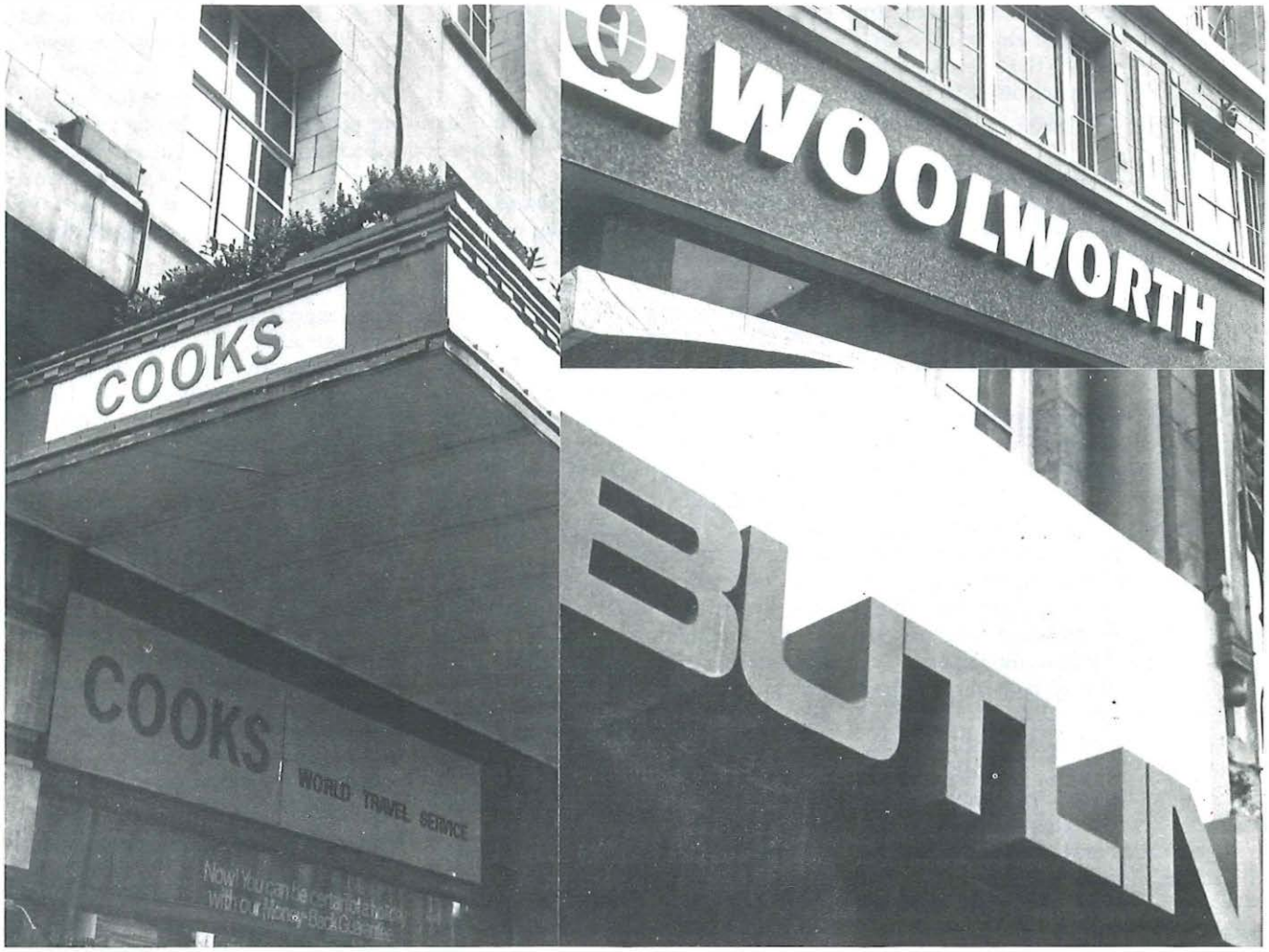
The last major activity before the service opened was that members of the Telecommunications and Postal Businesses visited each Postfax office, giving seminars to both management and staff. Machines were demonstrated, although their operation is so simple that only a few minutes' familiarisation is required to enable anyone to operate them effectively.

No major snags arose and the Postfax service opened on the planned date. The Post Office already has several ideas for increasing its scope and coverage, including plans for introducing additional centres this summer. A reduction in the present generous provision of machines at existing centres will allow these new centres to be opened without incurring additional fixed costs.

Interest in the service has already been expressed by several overseas administrations who wish either to set up similar activities or to extend their own bureau systems to the United Kingdom. The necessary planning stages have already begun for this exciting move towards an international Postfax service. The first country to be linked into Postfax will probably be Sweden, but the timescale for introducing this service has not yet been agreed.

Mr J. E. Briglin is a Senior Telecommunications Superintendent in Service Department at Telecommunications Headquarters. He was responsible for liaising with the Postal business on setting up the Postfax service.

PO Telecommunications Journal, Spring 1975



Consulting with the experts

AA Mann

Expert advice on setting up or reorganising private communications systems is being offered on a new commercial basis by the Post Office. The service, run by a special consultancy group, is already handling a wide range of work for customers throughout the country.

OVER the years the Post Office has become widely acknowledged as the best authority on telephone system design, and business firms and companies have never been slow to take advantage of the free advisory service which is still available in Telephone Areas. The fact that they are now being charged for an enhanced service at Telecommunications Headquarters (THQ) appears to have made little or no difference to demand.

About six months after the decision was made to put THQ consultancy on a commercial footing a small group of specially selected and trained staff from Marketing Department were ready to advise their first customers. In the first few weeks orders came in at a steady flow and by early this year major firms with well-known names like Woolworth's, Westland Aircraft, British Road Services and Thomas Cook had all signed up to "buy" the Post Office's expertise. Another big customer at present negotiating for a consultancy is Cambridgeshire County Council.

The fact is that in recent years more and more firms have come to realise the value of good communications and, indeed, how a purpose designed telecommunications system with a specifically tailored network of private circuits is not only much more efficient but, in the long run, also cheaper. And with the economics of telecommunications becoming an increasingly important factor, no longer are telephones – and the way in which they are used – treated in business organisations as casually as they have been in the past. There is now a positive drive in business organisations to make certain that costs are kept to a tolerable level.

Woolworth's, for instance, were concerned that their network linking the head office in London with nine other major centres might not be as efficient as it should be. Their first step was to call in the Post Office and discuss the situation with a member of the THQ consultancy team and leave it to him to make whatever suggestions he felt necessary for improving the position. Top priority was to measure telephone call traffic at the London head office as a first step towards identifying the need for an integrated network of pri-

vate circuits for transmission of speech and digital data, and this was done using a call information logger.

The traditional method of traffic measuring has always been by Strowger-type selector switch counting – a laborious and often inaccurate manual process which involved staff with stop watches checking switch occupancy every three minutes. Now the THQ consultants can call on the services of four newly developed call information loggers held by Telecommunications Development Department at the Field Measurements Group in Leeds.

These electronic units are about the size of a two-drawer filing cabinet and can either be plugged into or connected by hard wire to PBX main distribution frames. The value of the loggers is their versatility. As well as keeping a simple record of calls they can differentiate between incoming and outgoing traffic, whether a connection is intra-company or from outside and how long the line is engaged. Data from a punched paper tape produced by the logger can be processed by computer to yield information vital to businessmen, such as departmental telephone call costs and costs of calls to other intra-company locations, to assess the financial viability of private circuits.

Like Woolworth's, organisations as diverse as Esso, Rank Xerox and Scottish and Newcastle breweries wanted traffic checks by call information logger. Currently there are nine requests for consultancies involving call information logger PBX traffic records.

Naturally the type of network required by a firm, company or organisation depends on many things: its size, nature of business, number of outstationed offices and so on. Thomas Cook called in the Post Office because it was planning to move the major part of its organisation from London to Peterborough. In addition to a new PABX the company also needed private circuit transmission facilities for its holiday booking operation which is to be re-sited at Peterborough.

The booking procedure involves clerks at Cook's head office taking calls from any of 3,000 travel agents throughout the country. Details of a booking request are keyed into a computer, and a visual display unit in front of the clerk quickly shows whether the required aircraft flight and accommodation is available. Armed with this information on the booking system the consultant set to work and after months of careful analysis his report on the firm's full re-▶

A Post Office report on telephone equipment for Dial-a-Ride services has been prepared for the Cranfield Centre for Transport Studies. Here a customer uses a kerbside freephone to book seats on the Pick-Me-Up bus service currently operating at Harlow, Essex.

Inset: Within a few minutes the bus, on directions from a control room in the town centre, arrives at the pre-arranged pick-up point.

Staff at the head office of Thomas Cook's holiday organisation in London deal with booking requests by keying details into a computer, and the required information is quickly shown on the visual display units.
The Post Office has played an important role in planning communications facilities for re-siting this operation at Peterborough.

quirements was completed in January and favourably received.

Another well-known holiday name to turn to the Post Office to determine its telecommunications needs was Butlins. Their requirement was to define accurately the communications needs at eight holiday sites up and down the country.

Two of the biggest jobs are to rationalise the telephone communications of the Central Electricity Generating Board and British Road services Ltd. The CEGB has more than 600 locations throughout the country while BRS has 270 separate "offices" where some form of communications equipment is installed.

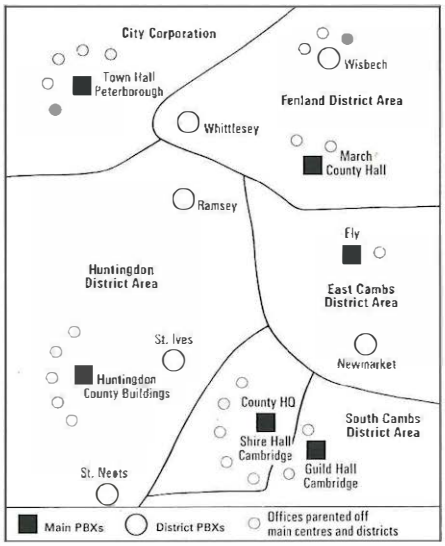
On assignments of this size a member of the consultancy team virtually "lives" on secondment with the company, reporting back to the Post Office only when necessary. One of his most important jobs is to get to know the company and its staff at all levels, to discover the patterns of telephone use, and to make recommendations based on defined telecommunications needs having regard to costs, business efficiency and the company's corporate planning situation.

On the British Road Services project, for instance, the initial approach was made to the Post Office last summer. The situation was that even though at least 50 per cent of the company's telephone calls were between depots there were no private circuits in operation and every call was made over the switched public telephone network. This was both expensive and often inefficient as – taking the figure of £210,000 per annum for call charges – it was likely that about £105,000 was being spent talking to themselves.

When the consultant moved in his first job was to make a whistle stop tour of some of the company's major depots to get a general picture of the total telephone operation. Next, all members of the BRS staff who make use of the telephone in their work were asked to take part in a national "log-a-call week". This meant noting details of their calls on forms designed by the Post Office and provided by the firm. The idea was to obtain an accurate measurement of the volume and type of traffic in a form suitable for subsequent design of a suitable network of private circuits.

Later the data from the forms was converted into punched cards at BRS and then sent to the Post Office Data Processing Service for analysis. Meanwhile the consultant contacted sales staff in every relevant Telephone Area to get full details of all the Post Office equipment currently in use by the firm. In this way a picture is now quickly being built up of what already exists and what needs to be done to meet current requirements more fully.

Another interesting job undertaken by the team has been to complete a report on available and potential telephone equipment for use in Dial-a-Ride bus or taxi services which in the last few years have begun to spring up in various areas of the country. In a Dial-a-Ride scheme the customer contacts a control centre to make a booking, stating the required starting time of the journey, where it is to begin and end and how many people will be involved. The controller confirms that the request can be met, tells the customer and then, possibly by radio, directs a vehicle to the pick-up spot. In this way a route is established which is determined only by the needs of the immediate passengers.



As a result of the recent Local Authority Act, Cambridgeshire County Council now takes in five districts – East Cambs, South Cambs, Fenland, Peterborough City Corporation and Huntingdon.
This means that there are many council buildings spread over a wide area, which is leading to communication problems. The Consultancy Service has been called in to determine and recommend the best possible cost/benefit communications network arrangements. It has also been asked to advise on the terminal equipment necessary to provide operational and financial advantages.
Already a record of calls has been taken on the various PBXs within the County and District Councils, and this information is being processed by the Network Planning Department at Telecommunications Headquarters to produce a network configuration.

Money for research into the whole Dial-a-Ride idea is being provided by the Department of the Environment through the Transport and Road Research Laboratory. They have placed a contract with the Cranfield Centre for Transport Studies near Bedford who in turn called in the Post Office to look at the telephone possibilities.

First task was to study the different types of Dial-a-Ride operation and then suggest the telephone equipment best suited to make the most effective contact between the would-be traveller and the system control room. Many ideas were considered, ranging from the erection of vandal proof kerbside telephones for customers to sophisticated types of key and lamp unit in the control room. Also discussed were possible suitable sites for Dial-a-Ride telephones, such as in department stores or supermarkets.

The Post Office report, which is now being studied at the Cranfield Centre pointed out that there was, in fact, a wide variety of configurations which could all be adapted to run a successful system either now or in the future.

Although most of the consultancy work to date has originated from THQ in London, its activities are by no means restricted to the capital from the Post Office point of view. Already a small paid consultancy team has been set up at Midlands Telecommunications Region Headquarters. The team is presently involved in re-designing the telephone network for one of the newly created metropolitan police forces in the area.

In London Telecommunications Region training has begun for members of the small paid consultancy unit that has been set up there. And, of course, there is no reason why other Regions should not follow suit if they discover sufficient demand in their particular areas.

The key to the development of the whole service lies in heavy users of telecommunications facilities continuing to realise the importance of an efficient and cost effective system. If present trends continue more and more organisations seem likely to call in the Post Office's paid consultancy services and for the Telecommunications Business this represents one of the most significant steps forward in commercial activity since the Post Office was established as a Corporation more than five years ago.

Mr A. A. Mann is head of the new Consultancy Group in Marketing Department at Telecommunications Headquarters.

PO Telecommunications Journal, Spring 1975

Action line for faults

LH Popple

Most telephone customers dial 151 to report a faulty line. To deal more rapidly and effectively with these calls the Post Office is developing new methods for handling complaints and clearing faults.

FAULTS on telephone lines are as old as the telephone system itself and one of the biggest problems facing the Post Office has always been to deal speedily and effectively with faults affecting customers' service.

The general organisation for dealing with customers' complaints about service for all but the smallest centres is the Repair Service Control (RSC) staffed by engineers to whom access is obtained by dialling "151". The RSC has evolved from the original concept of the test desk provided in the early manual telephone exchanges to test lines either by test extension circuits to the manual switchroom or by interception on the main distribution frame (MDF). It was then necessary to locate the test desk adjacent to the MDF in the apparatus room so that engineers had easy access to connect lines for test.

With the introduction of automatic telephone exchanges the test desk was developed by providing automatic access to telephone lines for testing purposes. The test desk still remained in the apparatus room because it had to perform a triple function. Some positions were used to receive and deal with customers' complaints, some were used to test and deal with working parties installing new lines and others were used to test junction circuits linking the exchange with rest of the telephone system.

In most exchanges therefore the test desk is situated near the MDF. Because the accommodation is designed to house automatic equipment little thought was given to the environmental conditions required for staff working in a "customer service" situation.

The concept of the RSC, however, has made it possible to divorce the complaint and fault clearance organisation from the other functions for which the test desk is provided. It is therefore possible to remove the RSC from the apparatus room environment and to provide the equipment and environment specifically designed to meet its own special requirements.

Over the past few years much thought and attention has been given to the clearance of faults on telephone lines and the control of the fault clearance staff. Repair Service Controls and the staff who work to them have an increasingly important role to play in improving the efficiency of the ▶

Following clearance of a fault at Ilford Repair Service Control, the record card is returned from a test position to the main files by a specially designed document conveyor.

A Repair Control Officer's desk at Ilford, which is equipped with three modules. The separate functions of these modules are for fault reception or distribution, for test access to exchange units and to test local lines.

service. They are, in fact, responsible for nearly 50 per cent of the total maintenance manhour expenditure.

Throughout the country there are some 350 RSCs of varying sizes in different situations with different staffing arrangements adjusted to local needs and telephone density. A new approach to the problem has now been made and during the last few years significant developments have taken place, notably at Ilford, Gloucester and Newcastle which have led to new concepts in the design of equipment and environment.

In all these projects it is significant to note that three quite independent approaches to the problem have resulted in the disappearance of the traditional test desk. Some sweeping changes, however, have been made at Ilford, incorporating a cordless key-operated test position which uses three modules mounted on standard office type desks.

The three modules, each responsible for a single function – reception, test access or testing – have been developed by Service Department at Telecommunications Headquarters and are connected by jacks and plugs. All modules are completely interchangeable and can be arranged in any order on the desk to suit the needs of individual Repair Control Officers.

The RSC at Ilford became fully operational in December 1974, and is responsible for thirteen exchanges in six buildings. It is currently receiving and dealing with complaints from 130,000 customers, and ultimately will be responsible for 200,000 customers.

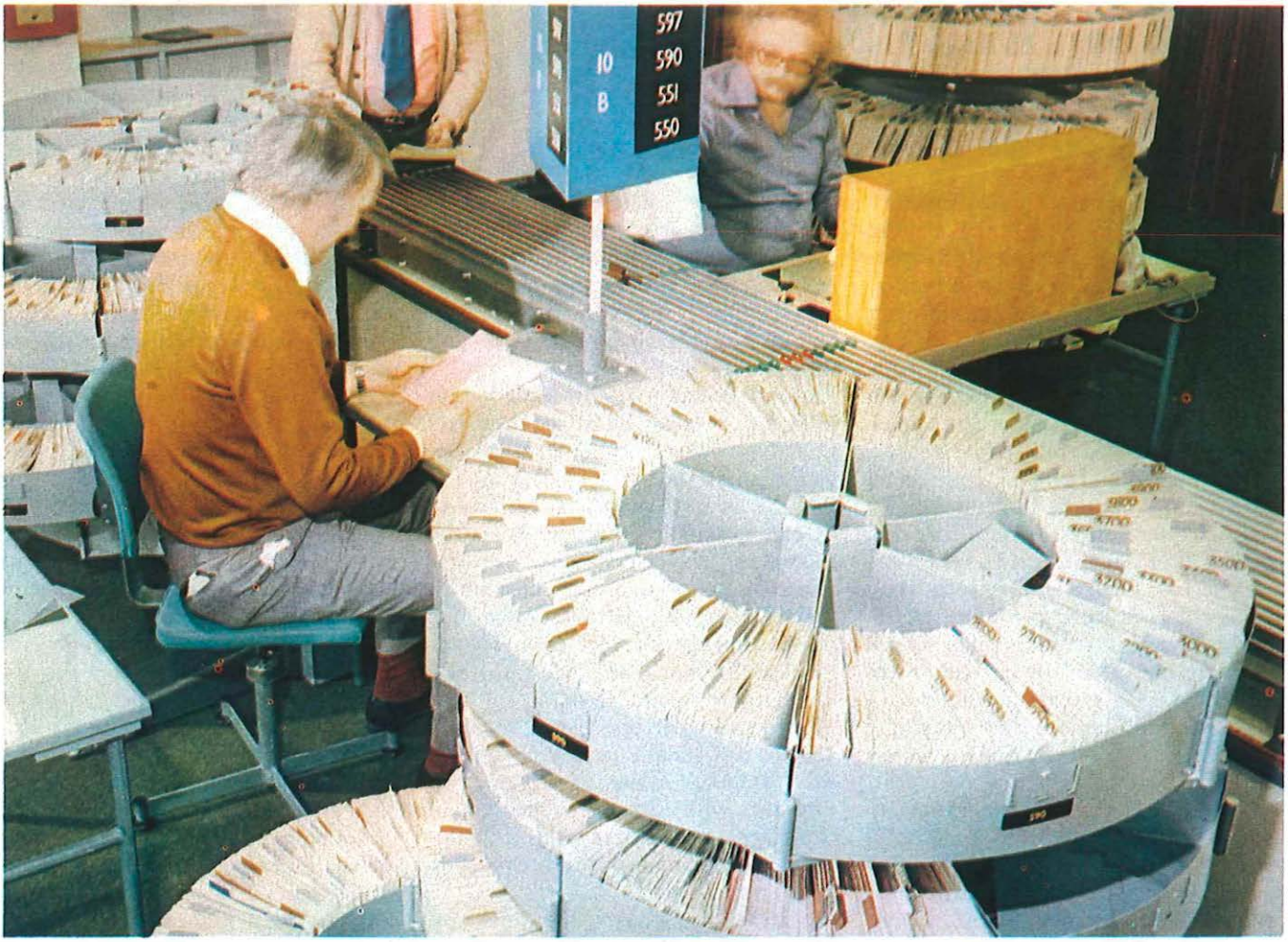
Situated in a large carpeted office, the RSC has a neat, noiseless, eleven-track document conveyor which carries the fault record cards from rotary files to the reception/diagnostic positions then onward, when the fault information has been recorded, to the fault distribution positions. When faults have been cleared the card is returned to the rotary files by the conveyor which also carries the fault docket, used for fault analysis and progress of fault clearance, from the reception/diagnostic positions to the filing positions. In this way all record and analysis work is taken away from the operational positions.

The Control is equipped with sixteen operational positions and can be extended to eighteen with four record/filing positions. The reception module can function for fault reception or fault distribution, thus allowing more flexibility. At present the Control is designed with twelve reception/diagnostic positions and four fault distribution positions.

Above, right: Fault record cards are stored at Ilford in these rotary files and can be quickly despatched to the operational positions by conveyor.

At "151" reception postions reports are recorded and diagnosed before being passed to a distribution position for clearance. The distribution positions are arranged so that they control the clearance of faults in a particular geographical area forming part of the control area. To increase job satisfaction staff are interchanged between reception and distribution duties on a suitable rota basis.

The "151" level lines from all exchanges in the RSC area are formed into a single group which is connected to reception positions via a distributor.



Incoming traffic is directed to each free staffed position in turn. Each reception module has only one "151" appearance, and when all positions are engaged on "151" calls up to two further calls can be stored in a queue. These are directed to the first positions to become free.

Any calls received by the distributor while the queue is full receives the engaged tone. Later this may be changed to a congestion announcement. The reception modules are designed to receive "151" calls or calls from faultsmen, thus allowing the same type of equipment to be provided at all positions. To cater for distribution requirements three incoming faultsmen's circuits and direct lines to Telecommunications Engineering Centres are provided.

The test access module has three basic test access circuits each with an associated finder controlled by a group of preselection press buttons which can select any one of seven groups of test junctions to the buildings served by the Control. Up to eight circuits can be accommodated in each group and the test junctions are connected to intermediate test selectors which can give access to ten exchange units. The ultimate access capacity could be 70 exchange units. Dialling is by using a keysender.

The testing module provides only those facilities required for testing local lines and is derived from the standard test desk circuiting. Some modifications and improvements have been included and others are being considered. In particular it is hoped to improve the dial speed and ratio test circuit and also to remove the effect of test junction capacitance.

The Repair Service Control is undoubtedly the hub of the repair service organisation and the planning of the equipment and the design of the system at Ilford has been developed very much with this in mind. To achieve a good time to answer the customer there must always be adequate staff, preferably from within the Control, organised to ensure that the number of staff available to answer the "151" service at all times closely matches the call arrival pattern. Operation of the control requires ready access to all subscribers' record cards from all positions in the Control.

To enable reception positions to advise customers of the progress of a fault and to deal with follow on reports or additional faults on the same installation there must be a foolproof method of recording the exact location of any card which has been removed from the file. There should also be a minimum amount of statistical and other paper work on the reception and distribution positions.

The RSC should be able to give information to the customer with respect to the progress of fault clearance time and to be able to offer a limited appointment service. The Control needs to be in command of the fault situation at all times, maintaining effective control of the fault clearance effort and giving an acceptable level of customer service.

The effect of using a document conveyor at the Ilford RSC will be the subject of a field trial, and the system will be carefully monitored over a period of twelve months. It represents a major step forward in RSC design, both environmentally and in terms of the operational equipment and system employed.

Mr L. H. Popple is an Executive Engineer at Ilford Repair Service Control in charge of organisation and maintenance co-ordination for East Area, London Telecommunications Region.

Space for a new earth station

PSJ Duffy

A second earth station to work in conjunction with Goonhilly is to be built at Madley, near Hereford. The site for the new station, which will help to cater for growth in Britain's satellite communications, was chosen after a wide and exhaustive search.

FOR MORE than 12 years Britain's satellite communications have been handled exclusively by the Post Office earth station on Goonhilly Downs at the southernmost tip of Cornwall. But not for very much longer . . .

To cater for growth in traffic, provide security of service by diversification and to avoid growing radio interference to the Goonhilly aerial systems (called earth terminals), a second earth station is to be built at Madley near Hereford on a site once part of a Second World War airfield.

Subject to final planning permission being received, work at Madley should begin later this year and it is hoped that the first aerial to be built there will come into service at the end of 1977. It will replace the Goonhilly aerial currently on the Indian Ocean region service.

A terrestrial radio relay terminal to be built about a mile from the Madley site will work to an existing radio relay station at Cinderford which will route the traffic to Purdown, Bristol. In this way the new earth station will be linked into the UK trunk network. To provide security of service Madley earth station will also be connected to Bristol by underground cables routed via Hereford and Gloucester.

The Post Office bought the Madley site about 18 months ago after a three-year search to find a location which measured up to the many technical and other requirements demanded. Factors which determine the suitability of an earth station site are its location, size, shielding and freedom from radio interference, terrestrial link reliability and economy, site geology and availability of services and amenities for staff.

Also the location of any earth station in Britain is governed by requirements that the lowest operational aerial elevation angle should be 5 degrees and that the earth terminals could have to operate to satellites positioned over the Indian and Atlantic Oceans in geostationary equatorial orbits. This limits the location to a site east of a line drawn through Berwick-upon-Tweed, Blackpool, Llanelli and The Lizard on the southern tip of Cornwall.

For economical operation the earth station site should be big enough to accommodate three to six aerials together with the associated main equipment and administrative buildings, power house, stores, workshop and garage.

A site surrounded by low hills provides some shielding against radio interference and a site in a natural bowl or valley is therefore preferred. But as the aerials may be required to point in any direction from east through south to the west, their operational elevation angles will range from 5 degrees in the east or west to about 30 degrees in the south. Hence the surrounding hills must be low enough to allow the aerial beams to pass unobstructed but high enough to give reasonable shielding from radio interference.

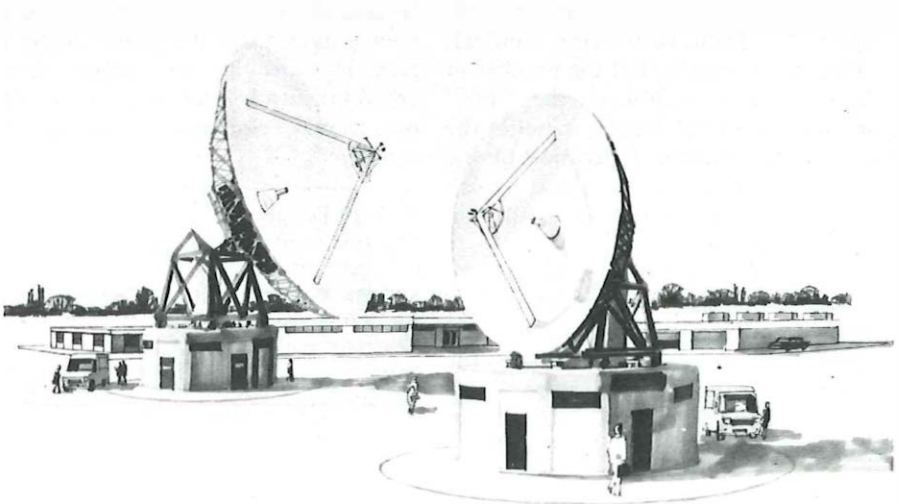
The Post Office has an extensive terrestrial radio relay network throughout Britain which forms an important part of the trunk network. It is continually being expanded and extended and shares common frequency bands with the satellite services. Other civil and military authorities operate radio and radar services in Britain and these sometimes inadvertently generate spurious frequencies which fall into the satellite services' frequency bands. It is essential, therefore, to ensure that there is no mutual interference between these other systems, either existing or proposed, and the satellite services. This is a most stringent condition and greatly reduces the area where a search for a site can be made.

Further, to provide insurance against the likelihood of interference from Europe during periods of abnormal propagation conditions over the sea, the earth station site must not be too close to either the east or south coasts. These abnormal propagation conditions can, in fact, sometimes be a problem at Goonhilly.

Another consideration is that as most international telecommunications traffic originates in or passes through London, the closer to the capital the earth station location, the shorter the terrestrial network connections need be. This results in lower costs and better reliability. The problem is, however, that this objective generally conflicts with the need to avoid radio interference from radio relay links because London is the focal point of many of these links.

There is also the quality of the ground itself which must be strong enough to provide stable foundations for large aerial structures. Many valleys and natural bowls were once river or lake beds and their ground strata often contains alluvium which is weak and unsuitable for aerial foundations. Ideally the site should also be easily accessible with adequate power and water supplies, and staff need housing within reasonable daily travelling distance together with usual amenities such as shops, schools and other facilities.

The search for sites began by considering all existing Post Office radio stations and Government owned sites which were known to be available. These, however, proved unsuitable because of intolerable radio interference at the frequencies at which earth-satellite radio links operate. A search was then made near London

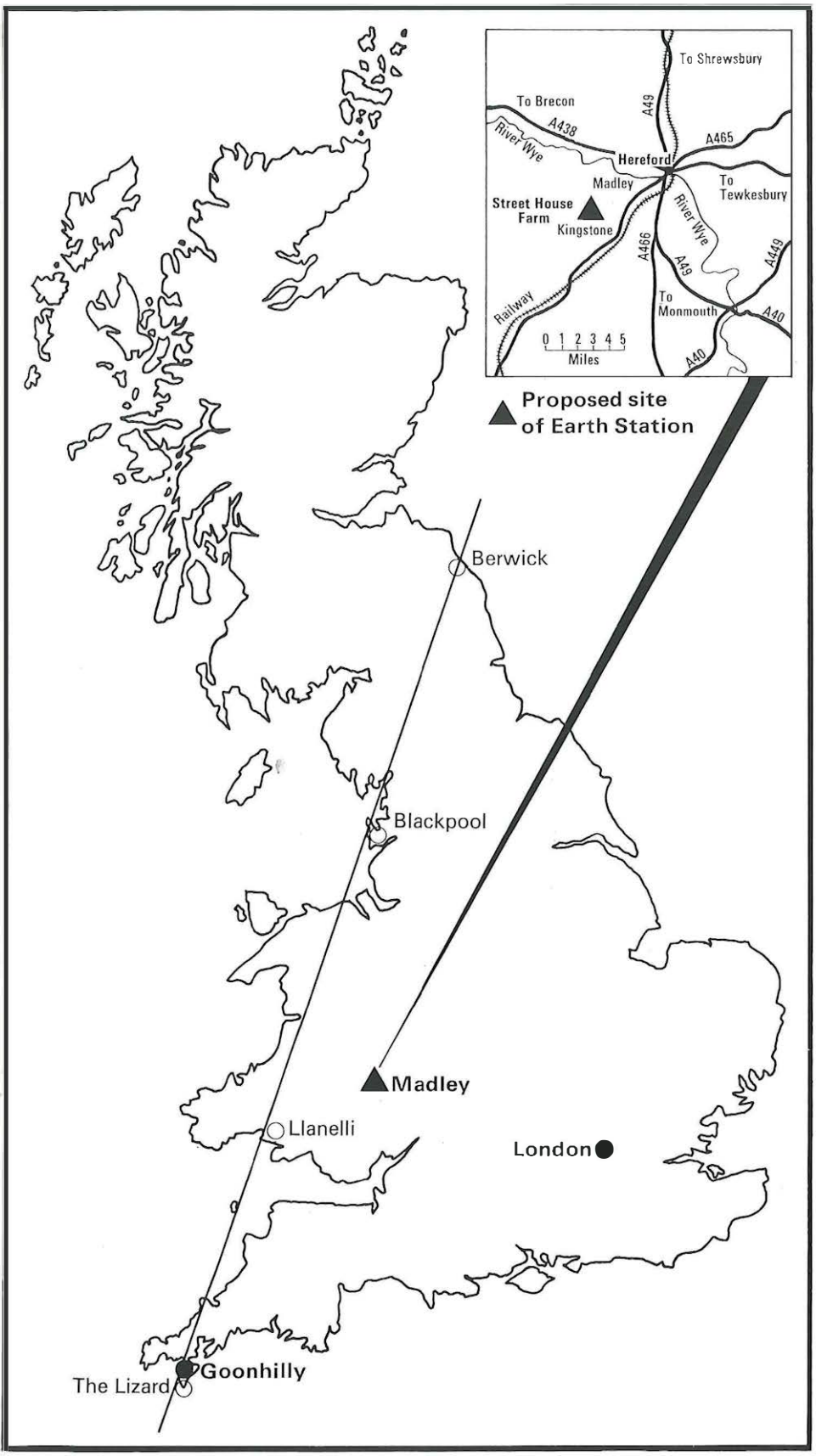


An artist's impression of the proposed first stage of development at Madley.

and extended in all directions as each of the various sites was rejected because they did not fully conform to technical requirements.

Eventually a small number of sites near Hereford were found to be technically acceptable. These were then considered in greater detail not only with regard to all the factors mentioned previously but also the probability of obtaining planning permission for the construction of an earth station.

The location of Madley in relation to London and Goonhilly. For operational reasons the earth station site had to be located to the east of a line through Berwick, Blackpool, Llanelli and The Lizard.



During the investigations into the possibility of buying one plot of land on the old Madley airfield, the adjacent Street House Farm was offered for sale by public auction and bought by the Post Office in September 1973. Immediately following this a public meeting was organised in Madley Parish Hall and after a frank discussion and lively exchange of views, the overall response was quite favourable to the Post Office proposals.

Following a review of the experience gained at Goonhilly and other overseas earth stations, planning of the design and configuration of the new earth station was carried out. Where practicable, improvements will be introduced to meet the changing conditions and full advantage of new technologies will be taken.

The site has been planned to have the steerable aerials on a line north-west running to south-east, and with the main building roughly in the middle. A power generating station, garage and workshop will be located to the east of the main building and a main station access road will link the central buildings to Stone Street, an old Roman road. The aerials will be served by a separate, narrower road and a public car park for sightseers will be provided near the main entrance gate. The site will be attractively landscaped.

In the main building the in-line earth station and multiplex equipment wings will be separated by an operational control area (OCA). The building will be designed without any roof supporting columns in the equipment wings to enable all the equipment space to be used to best advantage. A battery room and stores will be next to the multiplex wing and OCA. A service gallery for power and air conditioning equipment will run along the south-west side of the equipment wings. The south-west wing will contain a computer room, offices, drawing offices, canteen and welfare facilities.

The steerable aerials will probably be mounted on single-storey equipment buildings and rotate in azimuth on a rail-type track mounted on the roof. Heater panels, manually switchable in sectors will be provided to remove snow and ice from the aerial reflectors. Cables and waveguides from each aerial to the main building will be run in ground level troughs. Just inside the ▶

main building each waveguide will be connected to a switch which will allow any aerial to be connected to any of the blocks of equipment chains by use of manually inserted link waveguide sections. Thus flexibility in the use of aerials and equipment will be provided in a relatively simple manner.

Flexibility in the use of equipment chains of any particular earth terminal will be provided at a rack at the baseband interface between the earth terminal and terrestrial link multiplex equipment. Automatic switching will be incorporated wherever a working equipment chain has a dedicated standby chain and manual patching where one standby chain is provided to cover several working chains. If the automatic switches become faulty they will be bypassed by manual patching until they can be repaired or replaced.

The communication equipment chains will be as simple as practicable and the number of switches minimised to reduce the fault liability and simplify the control and supervisory systems. The broadband shf communication paths will be designed to allow the maximum flexibility in catering for the periodic alterations to the satellite service frequency usage plans.

In the main building the closeness of the equipment racks to the OCA will allow the number of supervisory and control facilities on the OCA consoles to be limited to those repeated from the remote aerial-mounted equipment. Arrangements may be made for the later incorporation of a computer-controlled data acquisition system when the number of operational earth terminals becomes high enough to justify its provision.

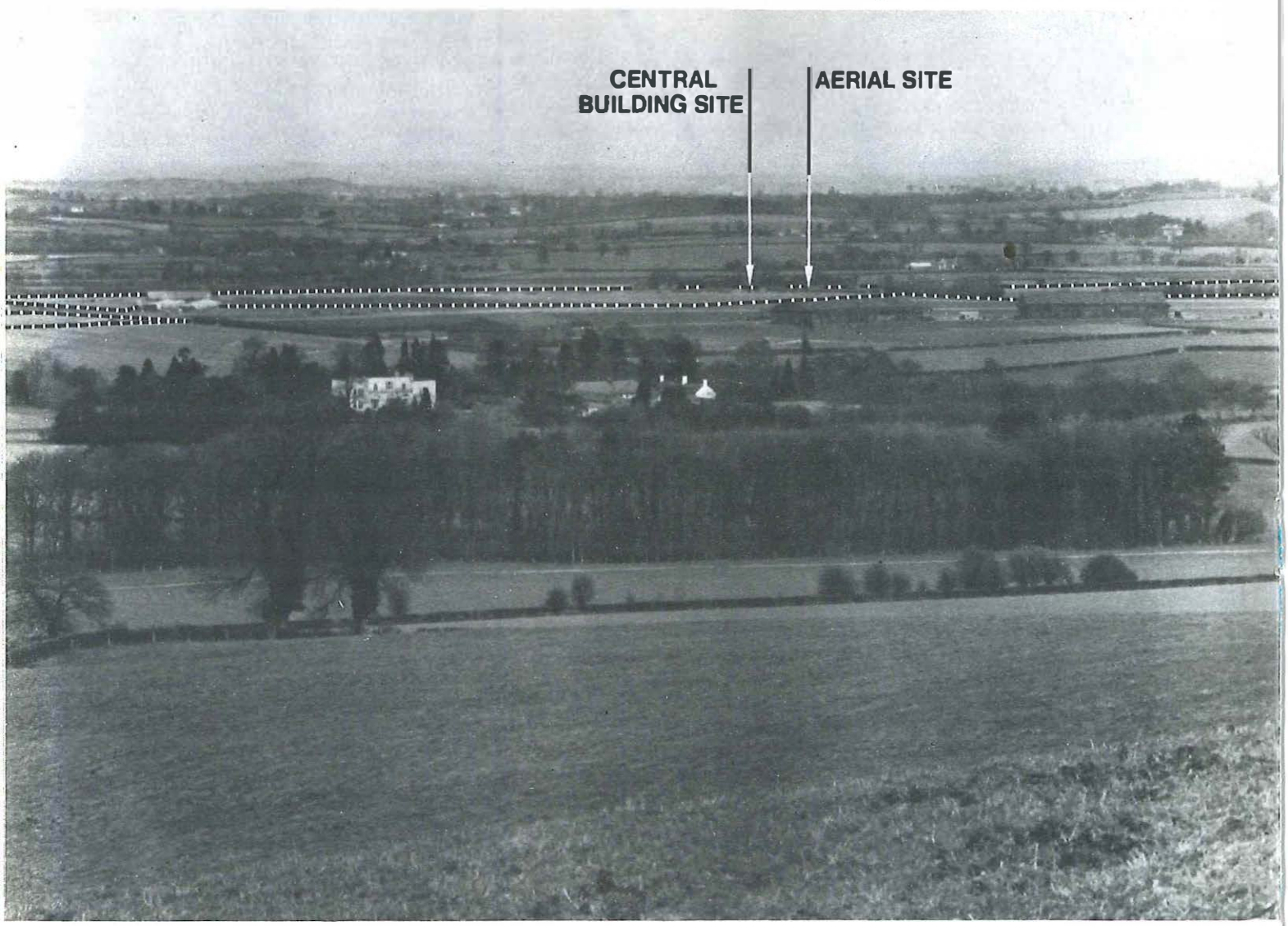
It is envisaged that this data acquisition system would provide system monitoring information to the staff in the OCA either automatically or on demand on television-type visual display units (VDUS) with a timed printed record if required. These VDUS would also be used to display earth system diagrams in colour with faulty items depicted by flashing symbols.

Power for the whole station will be generated on site and be backed by a standby supply from the local electricity board. Ultimately some five or six MW might be needed.

A land level survey, geological test bores, soil loading tests and earth electrical resistivity surveys have been completed and underground pipes and culverts have been located. Currently design of the buildings, roads and services is in progress. Specifications have been prepared for the provision of the first aerial. Meanwhile the land is being leased on a year to year basis for farming purposes until it is needed for Post Office use.

Mr P. S. J. Duffy is head of section in charge of earth station long-term planning in Telecommunications Development Department.

PO Telecommunications Journal, Spring 1975



A general view, looking north-east, of the site for the new earth station. Madley is five miles from Hereford, 133 miles from London and 224 miles from Goonhilly.

Modern workshops keep the wheels turning

SR Barrett-Jolley

The Telecommunications Business operates 50,000 vehicles. To maintain this vast fleet, motor transport workshops are being modernised and equipped with the latest mechanical aids.

WHETHER the motorist is on a Saturday morning shopping expedition, a high speed business trip along a motorway or a quiet drive through country lanes, it is almost certain that before going far he will see one or more of the 50,000 vehicles and trailers which make up the distinctive yellow Post Office Telecommunications fleet.

The vans and the lorries and the engineers who use them to help keep the country's telephone system running smoothly, are one of the most familiar sights on Britain's roads. But although people see these vehicles every day few probably ever consider the massive operation that goes on in more than 300 workshops up and down the country to make sure the wheels keep turning.

Every working day almost 4,000 Post Office mechanics – men trained to the highest standards – report for duty in surroundings that have in most cases over the past few years become as modern as the vehicles that are serviced there.

The latest workshops are well equipped buildings with sufficient bays and benches to cope with all types of maintenance work not only with the present fleet but also with enough spare capacity to allow for future expansion. There are adequate stores and a battery charging room, at least one pit, generally two lifts and a full quota of benches, electric drills and other tools. The workshops are well heated and the ample welfare accommodation comprises mess room, toilets and locker rooms.

Tyre repair equipment, an extensive range of workshop tools and servicing equipment such as a pressurised oil supply are other up-to-date features, and recently specific space standards have been laid down for maintenance of mechanical aids. One of the latest developments now being generally introduced is a special lift which allows a vehicle to be tilted either way for easy access to the front or back underside for cleaning and maintenance – all of which is a very far cry from the early workshops of the 1930s when it was not unusual for a mechanic to have to lay on bare earth to change a gearbox with perhaps only a mailbag for protection.

The Post Office currently provides six sizes of standard workshop varying from three to 11 work positions to deal with the 50,000 vehicles which regularly come in for servicings and overhauls. More than 32,000 of these vehicles are either the small 6/7 cwt type

Telecommunications vehicles undergo maintenance at a modern motor transport workshop.

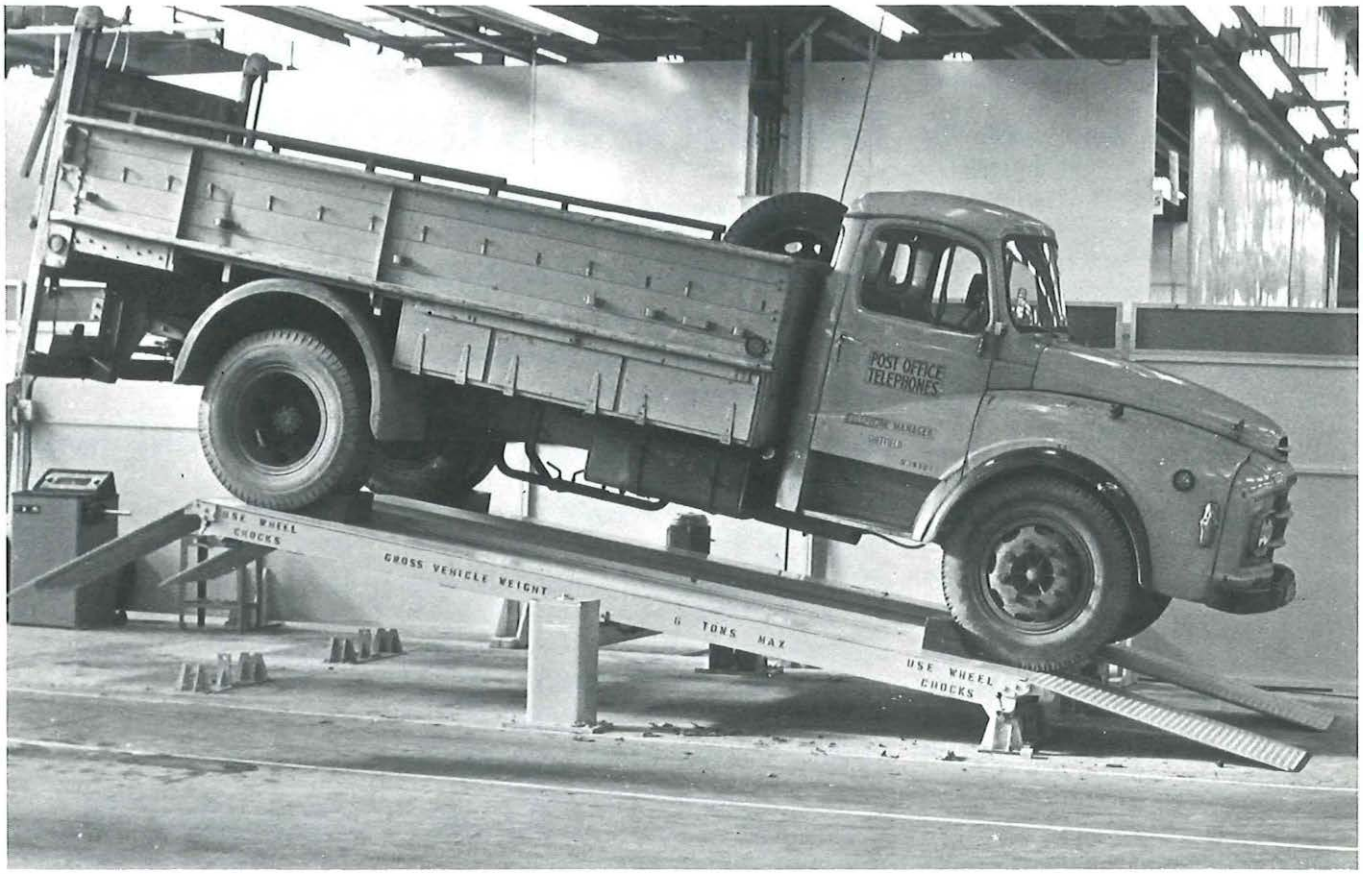
or of the larger 15 cwt design while the rest are made up of vehicular mechanical aids, articulated lorries and various others including trailers and cars for carrying passengers.

But as well as this fleet there are more than 1300 vehicles used on specialist work. These include outside broadcast, pole erection units, Land Rovers equipped with powerful winches, special cabling vehicles and an assortment of trailers including more than 400 automatic telephone exchanges.

In all the telecomms fleet covers 280 million miles a year and uses 13.6 million gallons of fuel. More than 8,000 new vehicles are purchased annually.

Obviously one of the biggest headaches facing workshops looking after a fleet of this size is keeping the vehicles clean and the introduction of automatic washing machines in recent years has been one of the biggest improvements. Before they arrived it was becoming more and more difficult to find men willing to spend all their time just washing vehicles: and a 150 strong vehicle fleet needed at least four men working full time.

In the mid 1960s however, machines, some crude by modern standards, became available for the first time and the Post Office was quick to take ▶



One of the latest aids to vehicle maintenance is this lift which tilts to give easy access underneath the front and rear of a vehicle.

advantage. At first the machines had two vertical rotating brushes with the driver having to steer his vehicle between them but improvements soon followed and the three brush version became standard Post Office choice. This meant that instead of one or two heated wash bays taking up valuable space an area 100 ft by 20 ft anywhere on the site could be equipped with a washing machine. And a job which previously took one man 40 minutes or more could now be done in less than five minutes.

The vast improvements in workshop conditions in recent times have been due to the combined efforts of the Post Office, the Post Office Engineering Union and the men themselves. In 1972 a joint Post Office Council of Post Office Unions Working Party reviewed standards in Telecommunications workshops and its recommendations included some of the changes already mentioned. Another result was a decision to change the shape of workshops so that they became squarer than the very wide and shallow type which has been standard for so long. This only allowed vehicles to stand singly side by side but the new layout permits two of the smaller 6/7 cwt or 15 cwt vehicles to stand behind each other. There is also provision for an area to be set aside for the storing of heavy portable items of equipment.

All this, of course, would have been nothing more than a pipedream for the first Chief Motor Transport Officer who began work in the 1930s. He was appointed after a Committee, set up to investigate future development of Post Office transport and its maintenance, had decided that a single organisation under the Engineer-in-Chief was needed to look after all postal, engineering and supplies vehicles.

At that stage the Post Office owned 500 vehicles – a fleet which had grown gradually from the 48 vans bought in 1919 when it was decided it was no longer economic or efficient to hire horse drawn vehicles and the odd motor van. In those days purpose-built motor transport workshops were unheard of and the vans and motorcycle combinations were garaged in any old shed, stable or alcove usually in or near a Head Post Office.

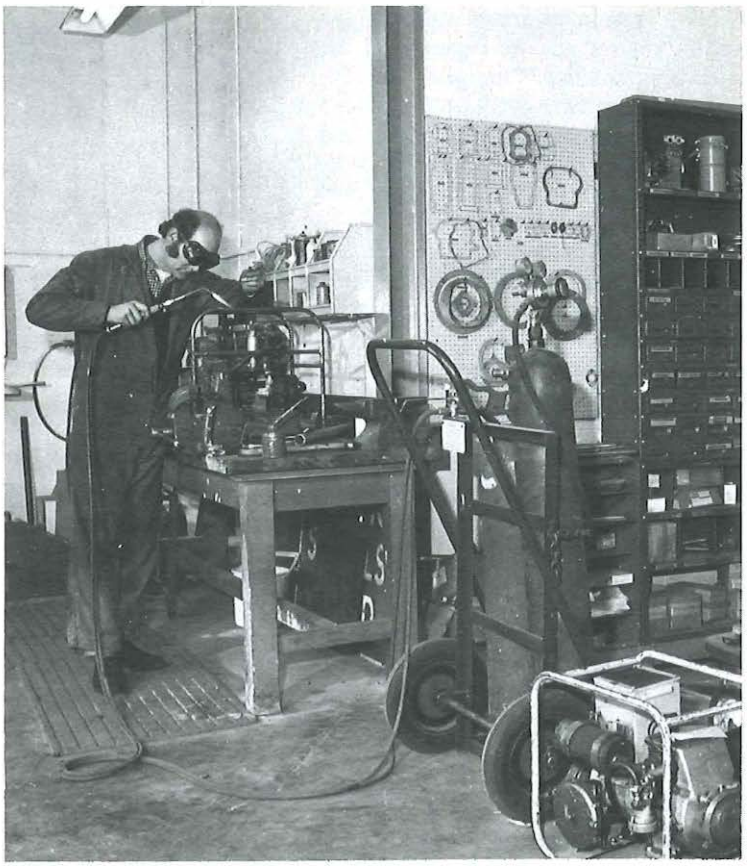
Most major work was, at that time, sent out to contract while much of the minor work was done by the postmen-drivers themselves. It was, in fact, part of their duty to do all carburettor and ignition repairs and tuning, tyre changing, oil changes and a variety of other small jobs.

When a vehicle was off the road being repaired it needed several postmen on foot to do the equivalent amount of work and this was one of the main factors which influenced the committee to set up a specialised organisation to improve Motor Transport maintenance and consequently Motor Transport accommodation. Soon 10 Motor Transport areas similar to the present regional layout were set up and controlled by an Area Motor Transport Officer, responsible to a Chief Motor Transport Officer based in London.

Motor Transport Workshops were established where there was sufficient work to keep a mechanic fully occupied and this meant a chain of small workshops in any convenient spot that could be found.

Early Motor Transport Workshops took over the small bays formerly used for the postmen's hand carts and by comparison with some these were "luxury apartments". They had stone floors, side windows and a waterproof roof and in some cases they even had roller shutter doors to keep out the weather! Some of the better ones also had free standing slow combustion coal-fired stoves for heating. One of these "bays" usually coped with the maintenance of a fleet of about 50 vans, the major work being done inside, while other light jobs, like decarbonising, were performed outside in the open air.

London, of course, as always, was the worst off for accommodation and



Above: How things used to be . . . mechanics at work on Post Office vehicles during the 1930s. It was then that workshops really began to become established.

Right: A mechanic welds the frame of a mobile generator set in the mechanical aids section of a motor transport workshop.

Motor Transport Workshops were set up under railway arches where the rumble of trains didn't exactly help with the "tuning by listening" method adopted in those days. Some vans were in fact specially designed with low overhead clearance to enable them to be accommodated in some of the main garages and Motor Transport Workshops in the London area.

By 1936 there were about 20 workshops in each Motor Transport Area, generally maintaining small groups of vehicles. In larger towns or areas like Edinburgh, Swansea, Hounslow or Cambridge up to 300 vehicles were maintained under one Mechanic-in-charge, now Workshop Supervisor. These areas have, of course, outgrown the original accommodation many times and there are several Motor Transport Workshops in some large towns.

Many Motor Transport Workshops were situated in old War Office buildings between the two world wars especially if the fleet was large, and these buildings served as both workshop and storage areas. They were spacious, some having been used as gun storage depots, but they were severely lacking in basic amenities such as lighting and heating.

Some workshops were in basements or ground level areas very close to the postal loading platform. An example of this type was still operating until recently at Hatton Garden, Liverpool where the Motor Transport Workshop and parking garage were below ground. The only natural light was about five feet above the back of the benches – a horizontal slit about nine inches by three feet. Low overhead clearance made conditions particularly bad especially as there was no air extraction.

By 1938, 268 Motor Workshops had been established and they were beginning to take on a more workshop-like pattern. The advent of the Second World War put paid to a lot of plans but after 1945 things began to get better again.

Semi-permanent workshops-cum-garages were being built with brick lower walls and corrugated asbestos above. These were very good by current standards, consisting of a workshop running the full width of the building, which, including garage space, was 175 × 100 ft. The workshop portion occupied the last 25 ft of the longer measurement. In this area were one or two pits, with the workshop supervisor office and stores at one end and a mezzanine floor over these for other storage space.

One of the major developments after the war was the setting up of Central Repair Depots at Yeading, Bamber Bridge, Coseley and Newhouse under the controls of the Chief Motor Transport Officer. Yeading was the most ambitious project. It was situated near Hayes in Middlesex and was ideally placed for use by London, South East and Eastern Regions but also carried out services for the whole country. Many vehicles sent to Yeading were completely dismantled, losing their original identity except for their serial and registration numbers.

Since the Post Office split into Posts and Telecommunications businesses, the Chief Motor Transport Officers no longer directly control Central Repair Depots. They now come under the Regional Motor Transport Officer of the region in which they are situated and the two which serve the Telecoms fleet are in fact, Yeading and Coseley.

Mr S. R. Barrett-Jolley is head of a small group in the Motor Transport Division of Operational Programming Department at Telecommunications Headquarters.

Launching into a new era

A NEW era in undersea cable laying and repair techniques began with the launching earlier this year of CS *Monarch*, the first of the Post Office's new twin cableships. The vessel and her sister ship, which is expected to be launched later this year, are the most advanced of their kind in the world.

Identical in design, the 3,500-ton vessels have four main cable tanks along their centre line and three arranged along each side, giving each a maximum cable carrying capacity of 1,430 tons. The main tanks are designed to store giant pre-loaded pans of cable weighing up to 80 tons, thus avoiding the conventional method of hauling in yard by yard. The main advantage is a reduction in turn-round time from days to a few hours.

Both ships will work from the Post Office's new Central Marine Depot at Southampton, which has been specially equipped to use the pan loading technique. The vessels will operate in British home waters where the great transatlantic cables terminate, and in the North Sea where cables link Britain with the Continent.

CS *Monarch* took to the water at Dundee just under two years after the contract for the two vessels was placed with Robb Caledon Shipbuilders Ltd. Long before, during the design stages, several differently scaled models were built to test for aerodynamics, stabilisation and manoeuvrability (see Telecommunications Journal, Autumn 1972).

At length the Post Office was satisfied that the new ships would be capable of working in more severe weather and deeper water than any of their predecessors. Twin diesel engines each of 2,600 bhp drive a two-input single output gearbox which drives a controllable pitch propeller to give a service speed of 15½ knots. To give extra manoeuvrability and improved stationkeeping, the vessels have a bow thrust propeller and a rudder thrust unit.

Another design feature is the helicopter landing platform so that personnel, specialist equipment or spares can be flown direct to the cableships. Each member of the 64-man company will have a cabin of his own.

CS *Monarch* is taken in tow following her launch at Dundee.

The four main cable tanks take shape in this early stage of construction of one of the new cableships.

An exact mod of the hull is a shell expan which repres plates placed in a flat plane

The Succession of Monarchs

When CS *Monarch* was named by Lady Ryland, wife of Sir William Ryland, Chairman of the Post Office, it became the fifth Post Office cable vessel to bear this famous name.

1 The original *Monarch* was a 512-ton wooden paddle steamer built in 1830. After patrolling the seas for nearly 40 years she finished her days somewhat ignominiously as a coal hulk.

2 The second *Monarch,* built in 1883, had a gross weight of 1,122 tons and was the first cableship designed specifically for the Post Office. She remained in service until 1915 when she met an untimely end at the hands of a torpedo or mine off Folkestone.

3 *Monarch* number three, built in 1916, was also ultimately the victim of war. About the same size as her predecessor and mainly a repair ship, she was mistakenly shelled by Allied destroyers in 1944 and sunk by a mine off Southwold, Suffolk, in 1945.

4 The fourth cableship *Monarch* was built in 1945 and at 8,055 tons gross was the largest cable-laying and repair vessel in the world. She could carry 2,600 nautical miles of deep-sea cable and could remain at sea for 100 days without refuelling or entering port. After 25 years' service she was sold to Cable and Wireless Ltd, who renamed her *Sentinel.*

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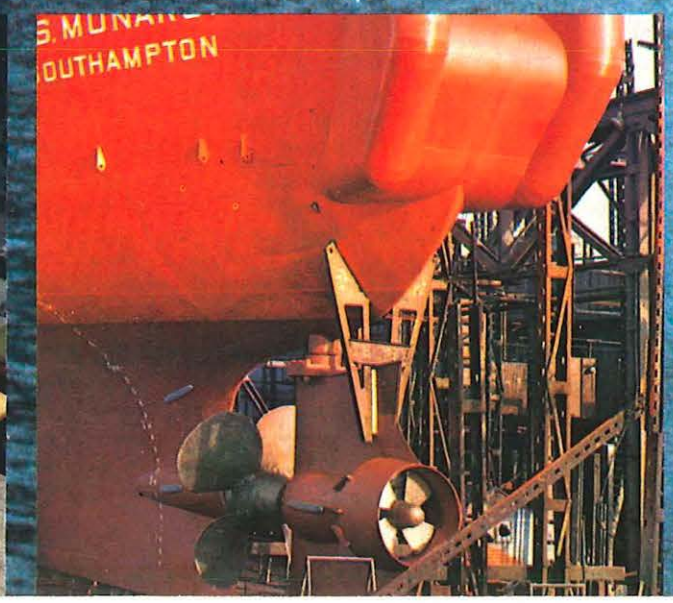
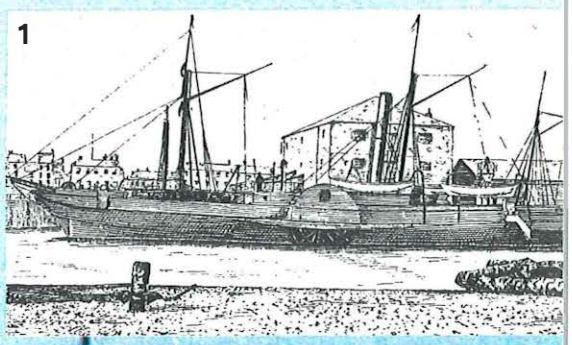
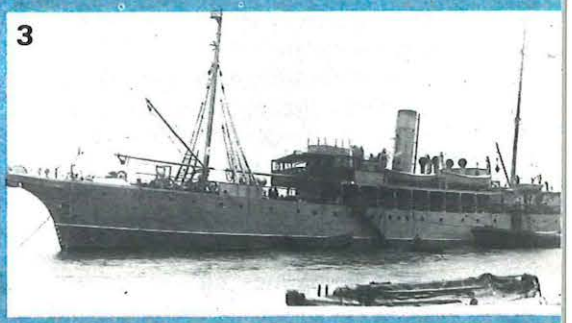
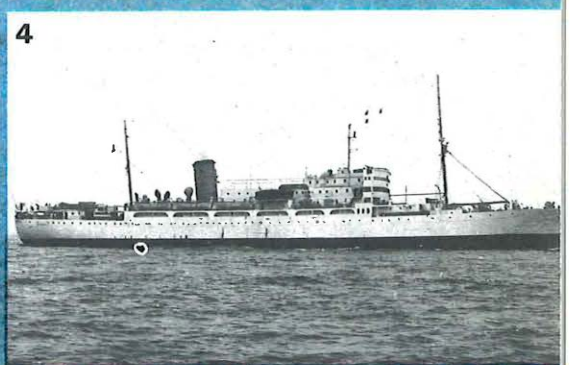


Stern view of CS *Monarch,* showing the rudder thrust unit which helps to improve manoeuvrability.







QUARTER OF A MILLION VIPs

RJ Carbery

Post Office Telecommunications employs about 250,000 people all of whom are the concern of a developing Personnel function whose role is to ensure that the business makes the best possible use of its manpower.

MOST business organisations would agree that however modern their equipment, however valuable their assets, the quality of the people who work for them is the most critical factor contributing to their success.

Yet how often is the vast potential of human resources properly tapped? How many businesses devote as much time and effort as they should to developing systematically and utilising these resources so that they and their staff get the maximum benefit?

Effective management of an organisation's staff resources is highly dependent on a well equipped and progressive personnel function. Post Office Telecommunications, which employs nearly a quarter of a million people doing a wide variety of jobs, is keenly aware of this and has in recent years introduced a number of improvements within the Telecommunications Personnel function.

When it is considered that in 1973/74 staff wages, salaries and pensions accounted for about half the total expenditure of the Telecommunications Business, it can immediately be seen that personnel management is not a fringe activity but an integral part of total operations.

The Telecommunications Personnel function – broadly those organisations whose responsibilities and activities enable them to specialise in personnel matters – has a particular responsibility to encourage and develop forward looking, progressive practices and relationships and so promote a working environment favourable to the best recruitment, deployment and development of all staff. This is vital in enabling the business to meet its objectives and employees to achieve personal satisfaction.

Although most personnel units in Post Office Telecommunications have some executive responsibility, they have an equally important advisory role in assisting and supporting all levels of management in their efforts to develop human resources and also to cope with the complex personnel problems with which managers are confronted today.

The Telecommunications Personnel function embraces a wide range of inter-related activities including planning manpower needs and resources and planning and advising on recruitment to meet those needs. There is also much work done in training and education, appraisal, career development, internal selection and appointments. Industrial relations (including pay negotiations), and provision and control of a wide range of personnel services, mainly in relation to pay and pay-related conditions of service also come under this umbrella. In practice, many of these activities are exercised in consultation, or negotiation, with Post Office unions.

Reorganisation of the Post Office in the late 1960s had a profound effect on the Personnel function and since then changes have been continuing at a steady rate.

Many factors have influenced recent development. There has been the pace of technological, social and economic change; increased devolution from Telecommunications Headquarters (THQ) to Regions and Telephone Areas and a growing awareness of manpower as a scarce and valuable resource. There have also been changing attitudes and behaviour patterns in industrial relations together with the effect of Government legislation on personnel problems and practices. Not least there has been the realisation that personnel management in the Post Office needed to modernise itself to meet these changes.

As a result a more professional approach, bringing special skills, knowledge, experience and attitudes into play, is needed if the function is to provide management at all levels of the business with high quality advice and support.

A significant feature has been the appointment of a Post Office Board Member for Personnel and Industrial Relations (BMPIR) and, more recently, the appointing of a Senior Director Telecommunications Personnel. Functional organisation in RHQs has also been strengthened but, more significant perhaps, is the trend towards separation of the Personnel and Finance functions in Telephone Areas. Now well over half the 61 Telephone Areas have a Head of Division (Personnel), with a seat on the Area Board.

Another important development has been an increase in specialisation, particularly in RHQs and THQ. Responsibility for personnel policies is largely centralised, so specialisation has been more prominent at THQ than elsewhere in the business. In recent years, however, there has been a noticeable strengthening of expertise in certain key activities. Manpower planning is now well established and has a vital role in identifying and assessing present and future manpower needs.

Management development, a systematic approach designed to enable people to develop their own personal potential to meet the present and future needs of the business, is also receiving much greater attention. Industrial relations has emerged as an important activity, stimulated by the growing power and negotiating skills of the unions and the establishment and operation of new joint consultative and negotiating machinery under the Post Office Act 1969.

Increased specialisation has created a need for new knowledge, skills and understanding among personnel staff at all levels. For example, while an appreciation of the behavioural sciences is recognised as valuable to all managers, knowledge and understanding of their application is now a vital part of a personnel specialist's equipment. A thorough grounding in behavioural sciences and other aspects of personnel work is available through a course of studies leading to membership of the Institute of Personnel Management (IPM).

Telecommunications Personal staff

are now encouraged to attend day release courses for IPM; and since the scheme was introduced in 1969 more than 100 staff, mainly from the executive grades, have been officially sponsored. Plans are being developed within the Telecommunications Management College for a basic personnel course aimed primarily at Higher Executive Officers and staff at the lower end of the Senior Salary Structure in THQ, RHQs and Telephone Areas.

Increased effort in the training and education fields is being stimulated by a policy which ensures that the Personnel function obtains its fair share of the available talent in the business. Personal qualities and the right attitudes are particularly important and greater care is therefore being taken in selecting staff for personnel work.

Although these measures have put the Personnel function on a firmer footing, scope for further improvement remains. At present, the bulk of personnel work in Areas comprises the application and interpretation of a detailed framework of rules and procedures, affecting pay and conditions of service. This is a necessary part of Area work but it is mainly routine and mechanical, demanding little in the way of specialist knowledge and skills, and little provision is made for more sophisticated activities.

The Personnel function in many Telephone Areas has not yet been given a positive role in relation to those activities. In the recruitment field, for example, it could make a more positive contribution by acting as a central liaison point for all recruitment matters, by advising on interviewing techniques and standards and by assessing the cost effectiveness of recruitment exercises.

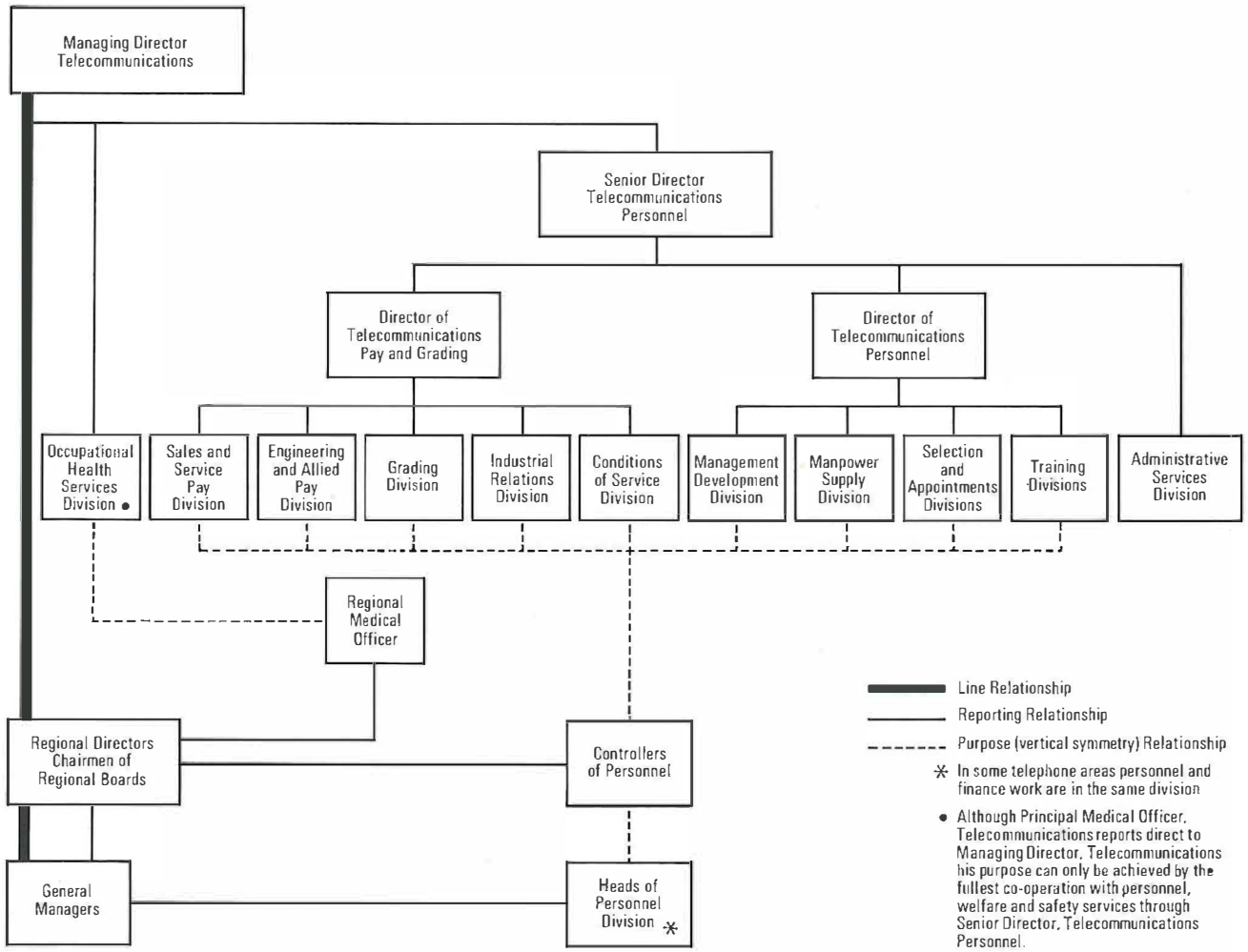
A further aspect requiring attention is that of systematic staff planning and development within the Personnel function. A business as large as Telecommunications should be able to offer recruits and existing staff a well defined and attractive career path within personnel, without adversely affecting short-term staffing requirements. The consequences of lack of systematic planning are personal frustrations, conflict between individual and business expectations and a weakening of the Personnel function's credibility.

Today the role of a progressive Personnel function must be involved with job satisfaction, job enrichment, effect of organisational and technological change on employee attitudes and the consequences of managerial styles on work relationships. So far the Telecommunications Business has done relatively little research in these fields. Generally, however, the indications are that the influence of the Personnel function is growing and, with more attention to changing requirements, its effectiveness will spread.

Mr. R. J. Carbery is a Higher Executive Officer in Management Development Division of Telecommunications Personnel Department. He is a Corporate Member of the Institute of Personnel Management.

PO Telecommunications Journal, Spring 1975

Organisation of Telecommunications Personnel Function



HELPING CUSTOMERS TO HELP THEMSELVES

F Lawson

Millions of telephone calls are made every day. To help customers gain full benefit from all the facilities provided, the Post Office makes positive efforts to encourage customer co-operation in using the telephone system effectively.

ANY BUSINESS offering a service which depends on the active participation of its users must provide adequate information for those customers and encourage their co-operation. This is essential if users are to get value for their money and the business is to ensure that its equipment is used efficiently, effectively and provides a maximum return on capital.

Take that man at your local railway station struggling with a reluctant vending machine. He may well have cause to feel aggrieved, for even if he failed to follow the operating instructions no responsible firm should simply blame the man. It should, perhaps, consider whether the instructions were clear, easily seen and vandal-proof.

Customer co-operation problems like these, and some far more complex, face the Post Office in providing a telephone service, both for private customers and call box users. And it is true to say the Post Office has a long history of caring about the service it gives, both in major campaigns aimed at promoting co-operation and fostering good relations and by innumerable small personal contributions. The repair service engineer who takes that little extra time to explain, perhaps to the elderly, how to use the telephone contributes to effective use of the system. The telephonist who goes out of her way to assist a caller who is in difficulty or distressed also makes a valuable contribution.

With continuing technical advances and the development of new facilities, however, customer co-operation problems also increase. In the early days of the telephone, for example, the only real problem was to explain to a new subscriber the difference between the mouthpiece and earpiece and to place their trust in the operator. Today, for customers with International Subscriber Dialling, there is only one correct number to dial for each call but more than 200 million possible wrong numbers.

Clearly, then, the Post Office is faced with a major task. To some people the term "customer education" possibly smacks of a patronising teacher and pupil relationship, but telephone users cannot be expected to know and understand all the facilities available unless they are told about them. Of course, no-one can be ordered to use the telephone properly, but encouragement by explanation and persuasion can have considerable impact.

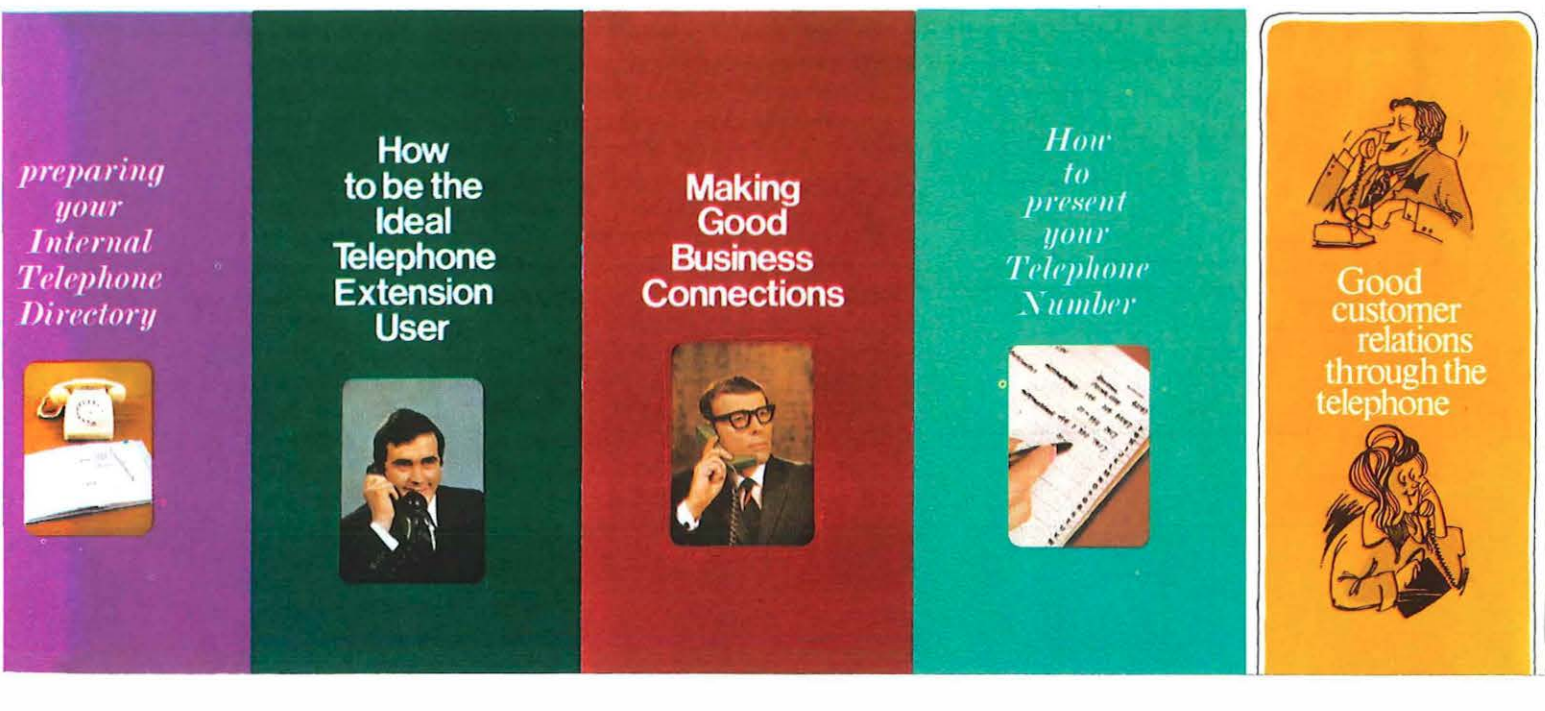
The objective in Service Department at Telecommunications Headquarters is to convince customers of the value to themselves in developing a good telephone technique. This includes such factors as resisting the temptation to make rapid repeat attempts when the distant number is engaged, dialling correctly, jotting down unfamiliar numbers before dialling, and answering the telephone correctly, with name and number.

It is recognised that much of the necessary effort must come from staff dealing directly with customers in Telephone Areas, and that they must have suitable "tools" to carry out their work. In this respect efforts are concentrated on printed items – leaflets, booklets and wallcharts – and audio-visual aids of which a major proportion are specially made films.

The seven leaflets and two booklets currently available each provide help and guidance on a different aspect of telephone use. Subjects include the selection and training of switchboard operators, the correct way to present telephone numbers, benefits to large organisations of a full-time communications manager, and the duties of a PBX supervisor.

A further leaflet may soon be added, describing the functions and responsibilities of Telephone Service Representatives. Its primary aim will be to bring to the attention of company management that TSRs are available to assist with local telecommunication matters. Their role exemplifies in many ways the best kind of close and knowledgeable customer co-operation work carried out in Telephone Areas. So much depends on local initiative, the ability to identify an opportunity to help and the willingness to follow it up afterwards.

The service manager, too, has an im-



portant role to play by ensuring that the maximum possible impact is achieved with the customer information "tools" available to his staff. Even the most attractively produced and easily understood material will be wasted unless it is efficiently distributed and presented to customers.

Much of the material is made available for business study courses, in addition to a wide and increasing range of specially-designed student material.

Another, separate aspect of customer information is the range of booklets and wallcharts for schools, colleges and youth organisations, which are the responsibility of the Education Service in Telecommunications Marketing Department.

Leading by example is another important requirement in creating close customer co-operation, and the latest addition to the range of information material is intended primarily for use by Post Office management entrants during their initial training courses. This booklet, which presents in a humorous vein practical points for establishing good relations through the telephone, can also be purchased by private firms and organisations.

Of the wide and varied range of Post Office films for showing both to the public and internally, two recent productions are particularly designed to encourage customer co-operation.

"The Badger Account" aims to impress upon senior and middle management the ways in which inadequate telephone arrangements can damage their business success. The film is designed to provoke discussion by the audience of the ways in which the company portrayed went wrong in its use of the telephone, and how it might correct its faults and deficiencies. This film won the Special Jury Award at the San Francisco Film Festival.

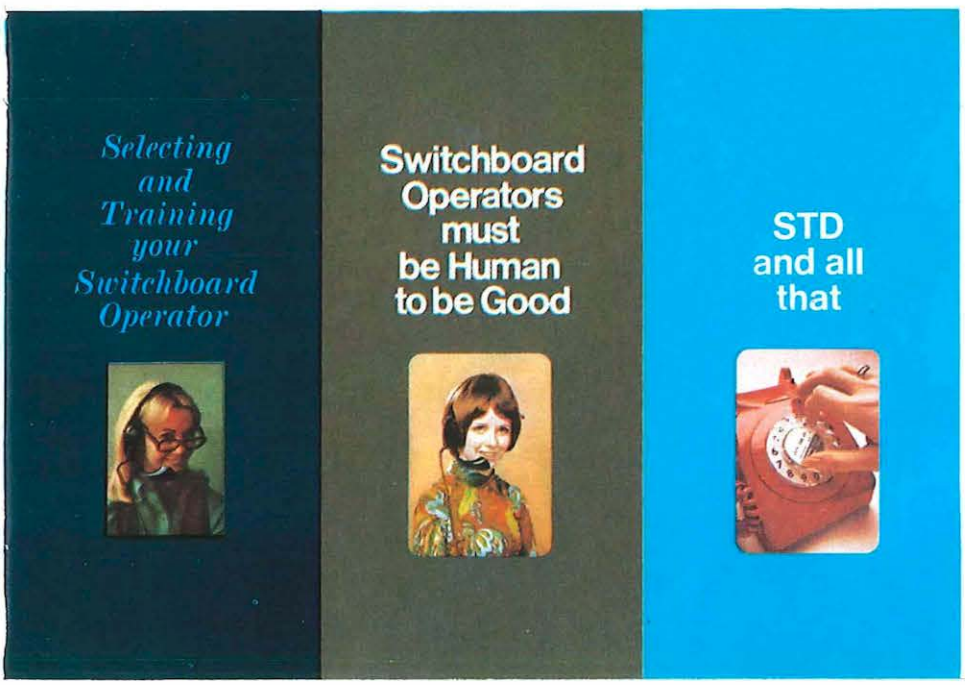
The second film, made as a companion to "The Badger Account", tells how tensions at the office can be self-inflicted because of poor telephone technique by extension users. Called "Hard Day", it traces the working day experiences of a father and daughter, who both unleash their frustrations in a quarrel on arriving home.

In the field of business communications, too, it is important to remember that a high percentage of the traffic each day is handled by PBX operators. Winning their co-operation in using the public telephone system efficiently is therefore beneficial not only to the telephonists themselves, but also to individual companies and their customers, and to the Post Office. A fresh approach to fostering good relations among PBX operators has been made by the Telecommunications Business with the launching of "Hello Girl", a twice yearly magazine which is distributed to operating staff at PBX installations with three or more exchange lines.

The magazine is designed to strike a suitable balance between features of general interest and light relief, and to stimulate ideas and suggestions from staff of customer firms. The response has been gratifyingly constructive, and all ideas, whether from customers or Post Office staff, are considered.

"Hello Girl", the various leaflets mentioned and the loan of films are all free to those customers for whom they are intended and who can make good use of them. With the current cost of ineffective use of the telephone system running into many millions of pounds a year, every possible effort must be made to improve customer performance and help reduce the level of non-revenue earning call attempts. The effort and expense which is put into producing and presenting customer information can therefore be seen as extremely worthwhile.

Father and daughter unleash tensions caused by their poor telephone technique at work, in this closing scene from the Post Office film "Hard Day".



Mr F. Lawson, until recently head of Service Policy Division at Telecommunications Headquarters, is now head of Sales and Installation Division in Telecommunications Marketing Department.

PO Telecommunications Journal, Spring 1975

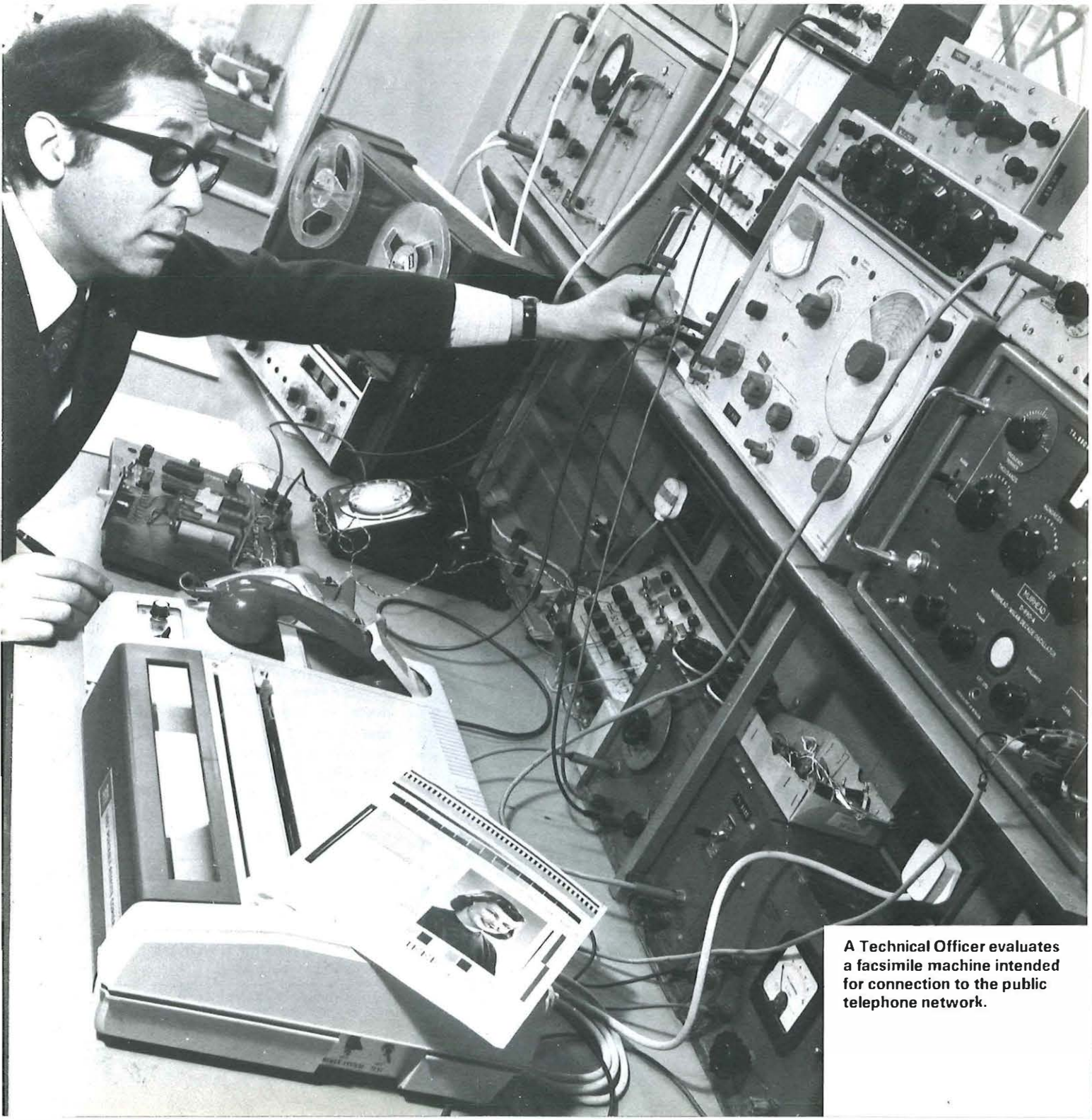
How attachments are formed

J Hutchins

Before any private telecommunications apparatus can be attached to the public telephone network it must first be evaluated by a special group at Telecommunications Headquarters to ensure that certain policy and technical requirements are met.

DEMAND for more and better communication facilities in recent years, coupled with spectacular advances in technology, has led to a significant growth in the amount of private apparatus used in conjunction with Post Office telecommunications services. Policy and procedures in respect of these attachments must therefore be constantly reviewed to ensure that they serve the community in the best way possible.

Because Post Office responsibilities for the efficiency of its telecommunica-



A Technical Officer evaluates a facsimile machine intended for connection to the public telephone network.

tions services extend to all users, and since apparatus installed for one user can affect the quality of service enjoyed by others, the Telecommunications Business must control the supply, installation and maintenance of all apparatus and wiring which form an integral part of the service provided for the public.

This means that basic apparatus like the telephone with dial, microphone and bell or a key and lamp unit interposed in the essential transmission path must be provided by the Post Office. And in the field of data transmission over the public switched telephone network the Post Office is responsible for the acceptance and emission of digital signals, hence the supply of modems – equipment which converts data signals from terminals into a form suitable for transmission – in the majority of applications.

At the same time the Post Office recognises that on occasions important needs cannot reasonably be met by equipment or apparatus currently supplied by it. For example, large PABXs are sometimes privately owned and installed, although the Post Office undertakes maintenance because the equipment forms an integral part of the network. Other well known – and privately maintained – exceptions are burglar alarms or unattended telemetry callmaking devices which have a strictly limited repertoire. And on rare occasions when customers require modem facilities which the Post Office is unable to offer, private modems are permitted. A recent example is the 2,400 bit/s private modem suitable for use on international calls.

Subscribers' apparatus can, in fact, be broken down into three categories of supply. First there are items, such as telephones, exclusively supplied by the Post Office and, second, competition with private firms to provide devices such as telephone answering sets or modems which can be used on private circuits.

The third category is apparatus supplied exclusively by outside firms. This includes, for example, a type of answering/recording machine which answers the telephone automatically, giving callers the courtesy of a reply and the opportunity to record a message. The renter can subsequently have messages played back over the telephone network when absent from his office by interrogating the machine from a remote installation.

Then there is a tape recorder incorporating a high-capacity tape used as an internal centralised dictation system during office hours. The audio typist or secretary can transcribe recorded messages simultaneously with the recording of dictation. With the addition of an auto-answer unit the equipment can be accessed from the telephone network after office hours.

Also regularly in use are about 30 types of facsimile machine. A typical example comprises a transceiver which transmits A4 size documents in four to six minutes and is obviously an asset in businesses that need to send copies of diagrams.

There is, then, a vast range of attachments available doing an interesting variety of jobs. However, as the Telecommunications Business has the exclusive privilege of running systems as defined in sections 24 and 25 of the Post Office Act 1969, acceptable attachments electrically connected to the public switched networks need to be licensed. Most are covered by the "General Licence for Attachments to Post Office Plant" published in the London, Edinburgh and Belfast Gazettes.

In addition to licensing, the attachments must also meet policy and technical requirements. The Telephone and Telex Schemes, which specify the conditions and charges for the general provision of service, stipulate that nothing must be attached to subscribers' installations without the written consent of the Post Office. And before Telephone Areas are informed that a specific attachment is acceptable, the supplier must submit it to Service Department at Telecommunications Headquarters for evaluation by the Attachments Group.

Switched network attachments which are, generally speaking, devices designed simply to make use of the network once a call is established, are evaluated to ensure that they are safe, do not cause interference and are compatible with the Post Office system. Any type of apparatus is permitted on Post Office private circuits provided it is safe, does not cause interference and is in an acceptable configuration. However, when a customer wants data transmission facilities over a private circuit he often rents a Post Office modem which can be switched to the public network if the private circuit becomes faulty.

Before sales staff in Telephone Areas issue advice notes for the connection of a particular device to Post Office plant, reference is made to a list of permitted attachments to ensure that it has been found acceptable by Service Department. This list contains the names of suppliers who have undertaken to produce identical models to those already evaluated, to maintain the attachments and to indemnify the Post Office against claims arising from their use. Similarly the subscriber indemnifies the Post Office in his annexed agreement, and promises not to modify the attachment without first obtaining written consent.

The suggestion to give attachments a seal of approval like a "kitemark" is often put forward, but the Attachment Group's requirements do not normally apply to the quality of service afforded by private equipment. In exceptional circumstances, as with answering/recording machines, some components of the attachment can significantly affect service to other users, and in such ▶

This private message switching unit, which serves up to 20 telex lines and private circuits at the premises of a London cable company, has been approved by the Post Office.

cases the Post Office insists that the equipment is supplied on rental terms.

This stipulation ensures a high standard of maintenance and has the added advantage of easy modification when changes are made to the system. For example, when a Strowger type telephone exchange is converted to TXE2 working most answering/recording machines attached to it have to be traced and modified to ensure they still release the line when incoming callers terminate their calls.

Service Department keeps manufacturers and suppliers fully in the picture regarding technical requirements by the issue of Technical Guides, which are continually up-dated as policy is revised or new services introduced. Recently a series of less formal Suppliers' Information Notes has been introduced. These provide advance information about new services, Technical Guide amendments and changes in attachments policy. They are serving to establish a rapport between the Post Office and suppliers on matters of mutual interest.

Close liaison with suppliers is also essential in the data field where terminals for connection to Post Office modems are exclusively provided by private firms. Dialogue between the industry and the Post Office takes place regularly at joint consultative policy steering committee meetings. This committee has been actively engaged in streamlining procedures to cope with the growth in attachment evaluation work which has taken place in recent years.

Output of evaluation work by the Attachments Group has increased as a direct result of augmenting its staff and rationalising its procedures. The average output per month in the last six months has been 111 cases, compared with an average of 67 cases cleared in the corresponding period a year ago – a rise of 66 per cent. The corresponding figures for applications received are 114 and 92, an increase of 24 per cent.

Although much has already been done therefore to develop its attachments work, Service Department still needs to negotiate a new series of Suppliers' Agreements which recognise modern commercial practices. The basic hurdles have been cleared and before long the administrative aspects of attachments work will be even further improved.

The policies already outlined also apply to the Post Office telex system, which lends itself to the application of store and forward message switching devices. In these devices a computer receives and stores messages for onward transmission when the required circuits become free.

Also in the field of telex, since 1971 the Post Office External Telecommunications Executive has been meeting demands for the connection of international leased circuits to its switching equipment in an international telex exchange in London. Early trials using this equipment proved so successful that more advanced equipment was ordered giving additional facilities.

At the same time the Post Office has licensed a number of installations using private message switching units. A good example is one shown on these pages which serves up to twenty telex lines and private circuits for use by a London cable company and its subsidiaries. The interface between the equipment and the telex line is Post Office data control equipment No 3A. This supplies the pulses to switch exchange equipment, contains the answer-back mechanism and generally protects the Post Office plant in accordance with the spirit of the integral network policy.

Attachments like this are useful because their ability to store and forward messages in a controlled order is a big help to operating staff, particularly when time differentials between countries are involved. There are also automatic facilities for a second attempt to set up a call if the first one proves ineffective.

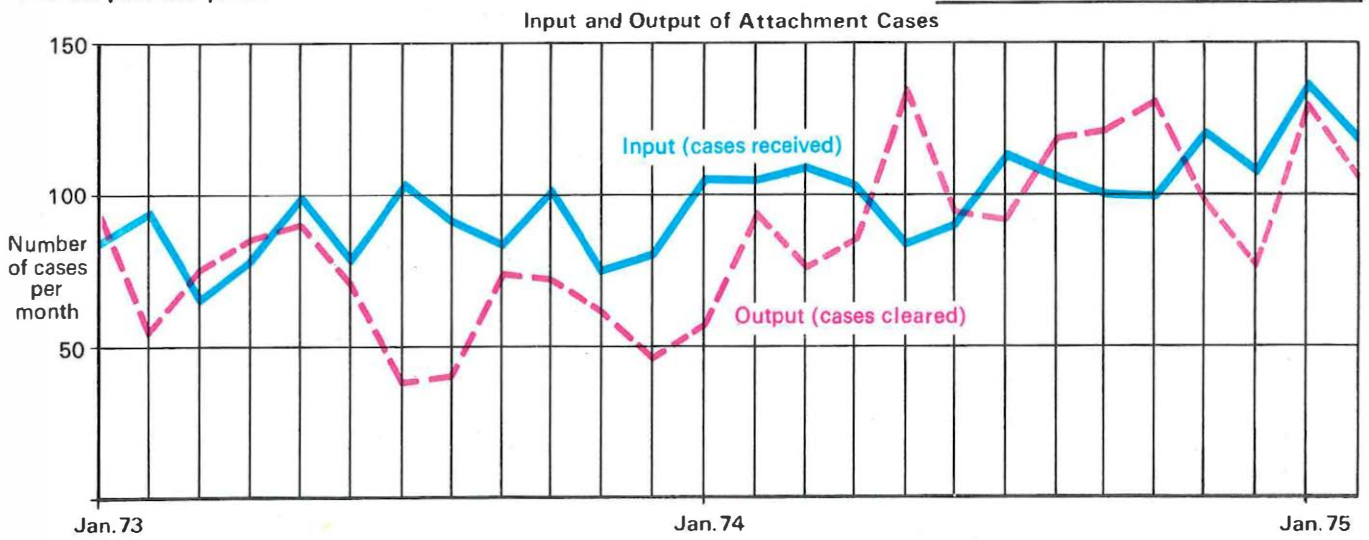
Finally, a word about international attachments policy. At recent informal discussions with a cross-section of suppliers and business customers with international interests it was asked why an attachment allowed on the Continent should not be automatically acceptable in the United Kingdom. Naturally in the interests of European harmony and efficiency in the communications field such a situation would be ideal, but it still remains necessary to progress towards that goal safely and surely.

Much is being done by Post Office representatives to achieve acceptable standards throughout the communications business. Working sub-groups of the Conference of European Postal and Telecommunications Administrations (CEPT) are already considering papers submitted by the British Post Office and other administrations. All these are with a view to producing a list of recommended policies and procedures for dealing with applications for the evaluation of different telephone attachments.

Mr J. Hutchins is head of the Attachments Group in Service Policy Division at Telecommunications Headquarters.

PO Telecommunications Journal, Spring 1975

An indication of the amount of work handled by the Attachments Group over the past two years.



STANDARDS SET THE SERVICE

Two basic measurements of telephone system performance are used by the Post Office to ensure that service to existing customers is adequate and so that plant can be provided to handle traffic economically.

JA Povey

FOR ANY service industry whose customers require service "on demand" rather than by "booking" or "scheduling" it is normally completely uneconomic to provide sufficient resources to meet the highest possible levels of demand with perfect service. Therefore a compromise has to be made between providing limited resources operating at high efficiency but less than perfect service at high levels of demand, and liberal resources some of which will not be used when demand is below peak level – the majority of the time.

The public telephone service is an especially difficult type of on-demand service industry to operate. A customer may not only require attention at any time but he needs to be connected, while he waits, to another telephone which may be situated anywhere in the world. Furthermore, customers become impatient if it takes a long time to be connected or if they are unable to set up a call at the first attempt and have to try again later, perhaps because the line is engaged.

Another complication is that call patterns differ, for example, between business and residential customers. However, although an individual's calls in terms of quantity, timing and destination are unpredictable, the behaviour of telephone customers generally can be predicted sufficiently well for telephone network planning and management purposes.

There are two basic requirements of performance criteria for telephone systems. First, a procedure is required for designing and planning a network to enable it to handle traffic economically. Second, the day-to-day performance needs to be measured to enable management to monitor that service to existing customers is adequate and, if necessary, to make possible short-term arrangements to counter persistent congestion. Two apparently similar but, in fact, quite different terms are used to express these two requirements in an objective way – "grade of service" and "quality of service".

Quality of service is a measure of the performance of the telephone system as seen by customers. In its most general sense it covers transmission quality, equipment faults, congestion owing to insufficient equipment, called-customer engaged, no reply, misdialling and other factors. Some of these result from Post Office practices while others are caused by customers.

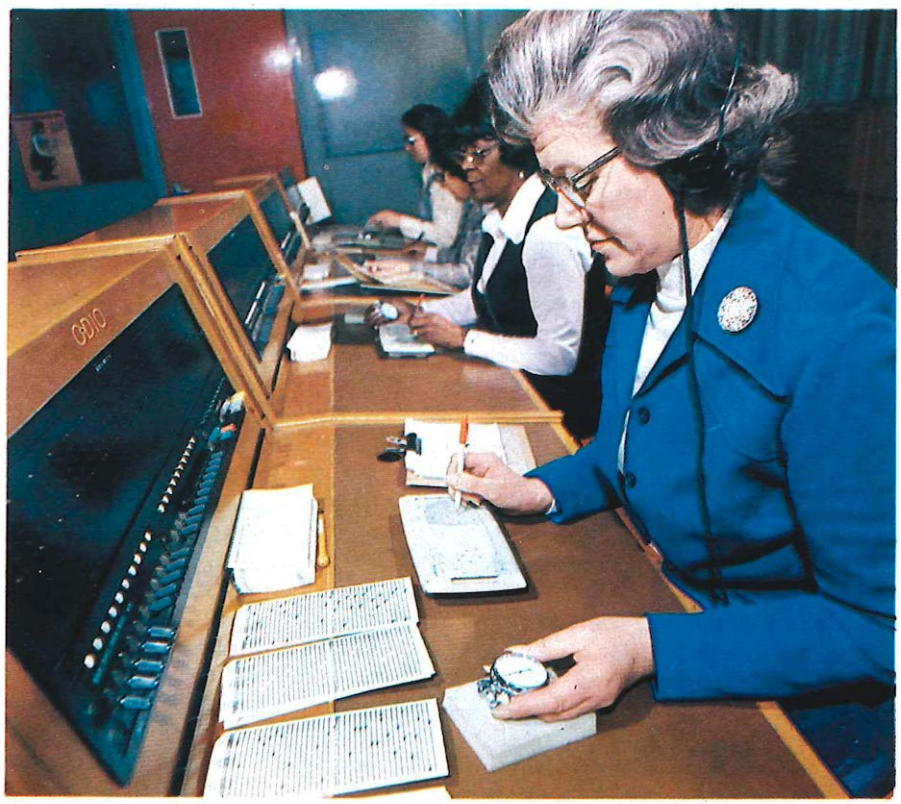
At present, quality of service measurement in the Post Office relates to average performance – that is, how customers in general view performance of the system over a lengthy period of time. In particular, as already mentioned, it contains a congestion component. This is expressed as the proportion of calls that cannot be connected because of insufficient plant. Most of these lost calls will occur during the busiest hours of the day but few calls, if any, will be lost for this reason at other times. Although the characteristic is strongly time dependent, present quality of service measurement taken over the normal working period of each day for all the working days of a month averages out this aspect of system performance.

Grade of service is related to the performance of the system over a short period of time. It usually applies to some part of an exchange or to a single route rather than the whole system, and to some specified part of the day. It is a measure of the probability or chance that a call trying to pass through that part of the system at a particular time will fail – or, for certain equipment, will be delayed – because there is no equipment available to handle it.

To obtain a value for this performance criterion, an estimate of the telephone traffic offered to that part of the system at the chosen time is needed. As grade of service is related to a particular period of time and is a measure of comparatively rare occurrences which are at a maximum during high traffic, the most important estimate of traffic offered is that made during the peak period of traffic, commonly known as the busy hour.

In practice, exchange equipment, internal switching stages and trunk and junction routes carry different streams of traffic and are extended at intervals ▶

Quality of service is measured at a telephone service observation centre. The observers record on punched cards, for later computer analysis, whether random samples of calls are successful or the reasons for failure.



as customers and traffic build up. Therefore provisioning standards are needed for the separate parts of the network. For economic reasons both these standards and the length of time (the provisioning period) for which quantities of equipment and circuits are provided differ according to their relative costs.

Grades of service (probabilities of congestion) form a convenient standard which not only can be understood by managers but can also be used by teletraffic experts during evaluation and optimisation of the traffic-handling characteristics of a switching system. Using this performance criterion, plant is provided for the separate parts so that the grade of service target will just be met at the end of the provisioning period.

Nobody has yet found a practical means of relating the overall quality of service for a network and the separate grades of service used for the provisioning of its parts. Nevertheless, the Telecommunications Business must explore, in a practical way, the link between provisioning standards and service quality in order to avoid both under-provision and over-provision of equipment, particularly as new technologies are introduced into the telephone system.

In the mid-1960s broad quality of service standards for management control and auditing of the system as a whole were agreed. Target figures for average call failures owing to congestion of one per cent for local calls and two per cent for trunk calls were arrived at by discussion and judgment rather than by any mathematical procedures.

Since quality of service is measured by monitoring calls, and call failures recorded are affected not only by the current provision of plant but also from some of this plant being busied out for maintenance purposes, monitoring the service achieved against these targets helps to generate pressure for the rapid restoration of faulty circuits to service. On the other hand, it should be kept in mind that approximately fifteen per cent of calls cannot be completed because of called customers being already engaged, and another ten per cent fail because of no reply.

Grade of service standards now used are very similar to those set during the 1930s. The basic standards have generally remained the same, any changes being in the way they have been applied. A typical current standard, that for dimensioning individual switching stages within an exchange, is the limiting condition that the grade of service should not be worse than 0.005 – that is, one lost call in 200 – at each stage.

For some years most trunk circuits have been provided to a standard to achieve a grade of service of 0.04 – one lost call in 25 – if the traffic reaches a level ten per cent higher than that forecast. The use of this traffic level was introduced to safeguard route grades of service when overloads occur on large groups of circuits, which carry traffic more efficiently than small groups and are therefore more susceptible to the effects of overload. However, a study is in hand to include a similar overload feature in all grades of service standards. For common control switching systems, in addition to overload-type standards, reliability safeguards are established by using grade of service standards under specified fault conditions.

Quality of service has been measured for many years using telephone service observation (TSO) equipment. In this observers are connected at random to samples of calls originating in an exchange, the arrangement being such that it is not possible to identify the caller. They record on punched cards for later computer analysis whether the calls are successful and, if not, record the reason for failure. The sample, which is not necessarily rigorously selected, has been set at 200 calls a month for each exchange. A TSO centre controls a number of telephone exchanges.

Plans are currently in progress to obtain most of this information automatically using a measurement and analysis centre (MAC) equipment which generates and observes the progress of test calls set up to test numbers in the home exchange and distant exchanges.

Grades of service for the separate parts of the network are not measured directly, but traffic capacity limits can be regularly checked from the measurements of traffic flows obtained by automatic traffic recorders which measure the occupancy of each group of circuits. Until recently traffic recorders have not been adequately used in all Telephone Areas, but the introduction of simplified procedures and improved circuitry have meant that one record a month is now taken at most exchanges and there is generally a greater awareness of the necessity for obtaining good traffic records. Graphs showing traffic trends and forecast levels of traffic are used to estimate when exchanges will need to be extended and how much additional equipment should be ordered.

Congestion-meter readings, which give a measure of the numbers of calls lost in a group of circuits, are matched against critical values calculated from the grade of service and call-holding times. However, these meters often under-register in periods of severe congestion as they are held operated during the time a customer is listening to engaged tone; alternatively, the readings can be artificially inflated because they measure all unsuccessful call attempts (which include repeated attempts) rather than the unsuccessful true demand. Therefore, the information is not sufficiently accurate for it to be used for determining circuit quantities, but it is a valuable aid as high readings draw attention to parts of the system suffering excessive pressures.

Traffic recording and congestion, or overflow, meters are the currently preferred forms of measurement but, as they cannot be used for some types of circuit, other types of measurement are also needed. These include meters which register when all circuits in a group are engaged, measure the length of time that all circuits are occupied, and measure the traffic on a single late-choice trunk where it is not possible to use overflow meters. Others count total call attempts, effective calls, register seizures, etc. Call-duration recorders measure average call holding times, and route-call recorders register the subsequent destination of calls from the point at which the recorders are connected.

All the measurements are limited in some way, the main reason being the high variability of traffic. Investigations into traffic variation and its influence on traffic measurement are under way but, in practice, each circuit group has a fairly constant period of time during the day when the mean traffic level is at its highest, although it is also clear that this level varies from day to day, and from week to week. One part of the present studies is to review the basis for providing equipment. For example, if it is not economic to provide equipment to carry the traffic in the busiest hour of the year, what lesser standard should apply?

A major problem which may arise from the study of traffic variability is that, if procedures for measuring, calculating or forecasting traffic need to be changed, the effect of these changes on dimensioning rules must be carefully considered.

Meanwhile, although studies con-

tinue which should lead to improvements in measuring techniques and related dimensioning procedures, the telephone administration has to continue to manage its day-to-day operations, to plan, and to execute policy decisions. Measurements of past traffic are used as a basis for forecasting levels of traffic for obtaining sites, designing buildings, designing and ordering telephone exchanges, estimating exhaustion dates, and for planning and augmenting trunk and junction routes. They, together with congestion measurements, are also used to check that congestion is better than the acceptable limits – that is, preventing under-provision. Emphasis is currently being given to checking that plant is as fully occupied as it should be – that is, preventing over-provision – by monitoring "Asset Utilisation Factors" which compare achieved traffic with effective capacity.

Until a few years ago little attention was given to studying the behaviour of telephone customers. The relatively unsophisticated switching systems did not demand it, nor were extensive data collection and analysis systems available. Human factors research has been accelerating in the last few years and many countries, including the United Kingdom, are now devoting much more effort to research into the behaviour of telephone customers, the variability of traffic flows, etc.

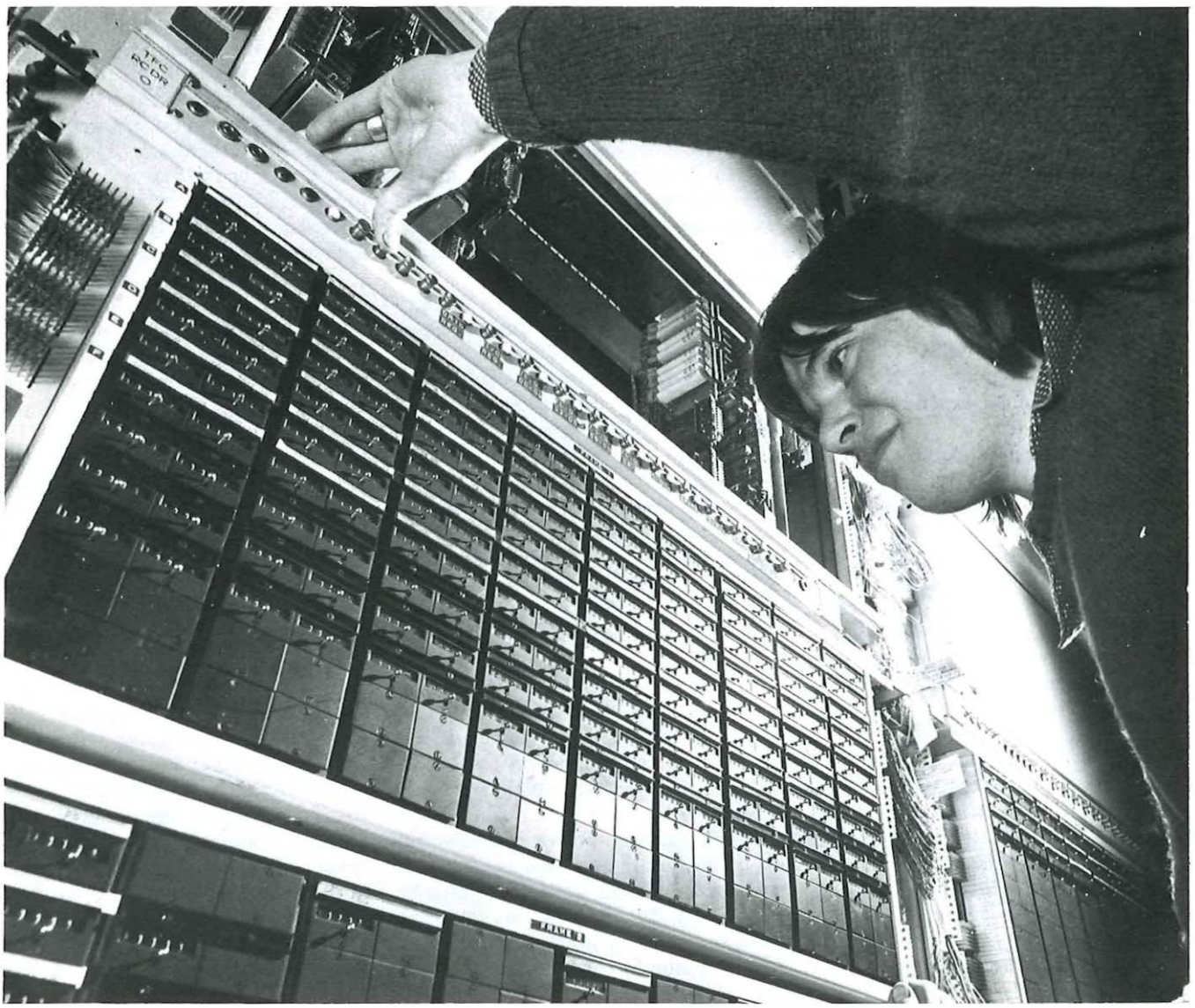
Many aspects of customer behaviour can influence the running of the service. For example, customers failing to set up a call tend to make repeated attempts. This does not significantly affect the design of exchanges where the control and switching functions are embodied in the same devices, but common-control exchanges need to give equal attention to each call attempt. Therefore more information on the extent of repeated attempts is needed for the design of these exchanges. The International Telegraph and Telephone Consultative Committee (CCITT) is studying the effect of repeated attempts on service and system performance, and the British Post Office is actively participating in these studies.

The Post Office, in fact, maintains close contact with teletraffic experts in other countries, attends international congresses and participates in related activities at the CCITT. With the present growth of international telecommunications and the influence of one country's service standards upon those of another it is essential to continue this process of greater involvement and collaboration on an international scale, which will inevitably benefit all participating countries.

Mr J. A. Povey is head of the Teletraffic Division in Telecommunications Development Department responsible for traffic recording and grade of service studies

PO Telecommunications Journal, Spring 1975

Automatic recording equipment is set up to measure the flow of traffic on a group of circuits at a telephone exchange in London.



Mr E. J. Forde, an Assistant Executive Engineer in Manchester South Telephone Area, last year spent four weeks in Sweden as part of a staff interchange scheme between the Post Office and the Swedish Telecommunications Administration. In this report, he reviews development of telecommunications services in the country where more than 60 per cent of the population have a telephone.

An exchange view of Sweden

WITH FEWER than five million telephones in service Sweden is placed a modest tenth in the world "league table". But in telephone penetration per head of population the country is second only to the United States of America.

Latest figures show that there are more than 600 telephones for every 1,000 people in Sweden, and although its Telecommunications Administration operates on a much smaller scale than those of the USA and Britain its degree of sophistication is no less advanced. The telephone system, for instance, has been fully automatic since 1972 and now almost the whole of Europe can be reached without operator assistance.

As well as having a healthy telephone system the Administration also has responsibility for telex, telegraph and data transmission services and the distribution of radio and television programmes. It has some 42,000 employees and annual turnover is around £350 million. There is usually no appreciable profit after annual investment and interest payments on loans from the State.

One of the most significant dates in the history of Swedish telecommunications was 1921. It was then that the decision was made to install the L. M. Ericsson 500-line selector system for major exchanges and to use a step-by-step crossbar system produced by the Administration's own factories for the smaller exchanges. The 500-line selector system was based on the use of a mechanism which could select one of the 500 customers' lines on its selector bank and connect him to the control area of the exchange. This control area, in which crossbar switches have superseded relay switches, provides the same operator functions as all common control exchanges. Using the 500-line units, exchanges can be built up to serve a maximum of 40,000 lines. There are at present 112 of these exchanges in service with a combined total of 2.1 million telephone lines connected to them.

The exchange policy decided in 1921 has not been radically altered since, but with the coming of transit switching the Administration has proceeded from a crossbar transit exchange system to a stored program control system, both manufactured by L. M. Ericsson.

A small electronic exchange serving up to 2,000 lines is at present being developed by the Ellemtel company, which is owned jointly by the Administration and L. M. Ericsson, and it is expected that the exchange will be used to replace existing crossbar exchanges of this size. Reed relays are being used initially in the switching path of the new exchange, but there are plans for the switching unit to be replaced by one which is entirely electronic.

For charging automatic calls Sweden is divided into 210 rate areas, each consisting of one or more exchange areas. If a call is within an exchange area one pulse or unit is registered on the customer's meter irrespective of the duration of the call. For calls between exchange areas within the same rate area (junction calls) the meter is pulsed every ninth minute. For trunk calls – that is, between different rate areas – the meter pulse interval varies with the distance between the rate area centres. For example, up to 45 km the pulse interval is 45 seconds, whereas for distances over 450 km the interval is eight seconds. In 1972/73 the average number of metered units per customer was 4,238 at a cost of 1.4 pence per unit.

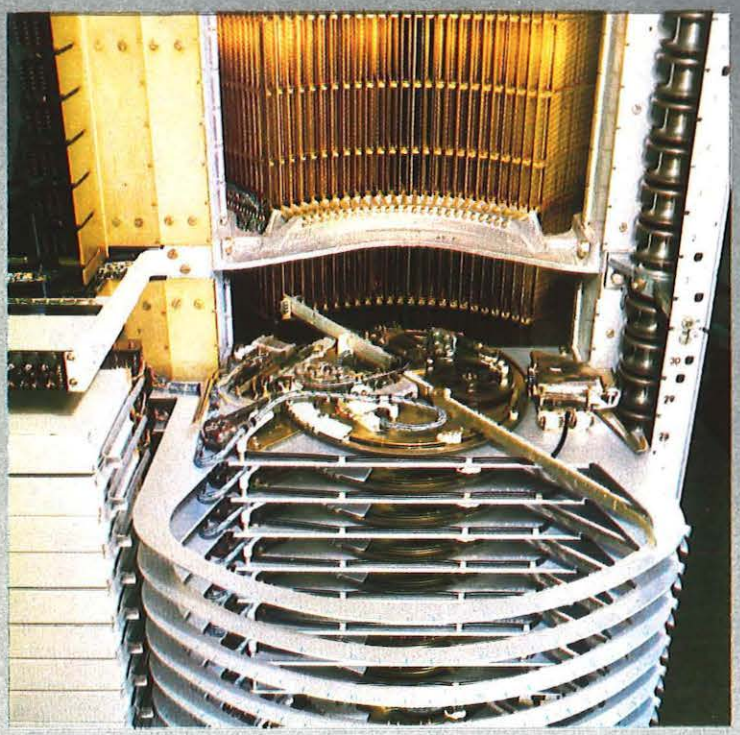
To carry its telecommunications traffic the Swedish Administration has 23 million circuit kilometres of cable, 60 per cent of which is used in the trunk network, now organised in three national levels. Main areas of population and commerce like Stockholm, Gothenburg and Malmo are connected by 10,800 channel 60 MHz cables. The Stockholm-Gothenburg link was, in fact, probably the first 60 MHz system to come into commercial use.

Smaller and less densely populated areas are served by 900–2,700 channel 4–12 MHz systems which are distributed by cable and radio links, and by 300–900 channel 1.3–4.0 MHz systems distributed solely by cable. Pulse code modulation 30–32 channel systems are being introduced into the local telephone networks.

Sweden, in fact, took the first step into the coaxial age in 1949 with a 600 channel system between Stockholm and Norrkoping. Although this was late compared with other countries it enabled Sweden to begin with modern coaxial cables. These were originally designed for 4 MHz systems but they have nearly all since been equipped with 12 MHz systems, and according to results of recent investigations they will be suitable for 60 MHz systems.

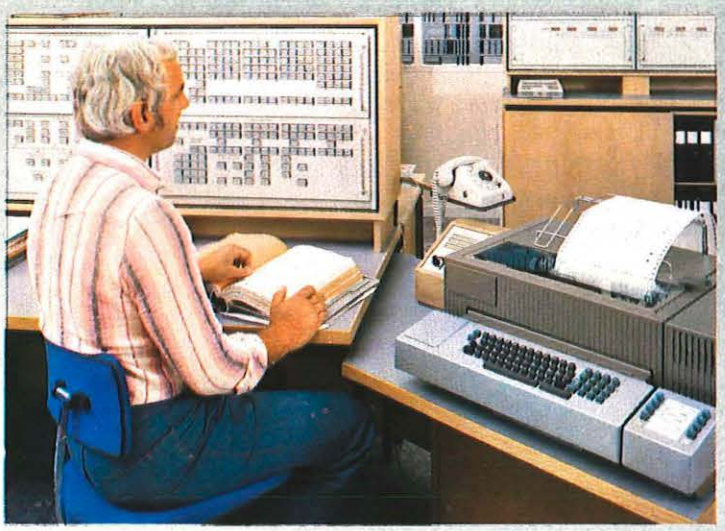
As in many other countries expansion of the Swedish telex system in the 1950s marked the beginning of a decline in telegraphy. This trend has continued, but to reduce the operational costs and to provide telegraph customers with a better service a computer controlled telegram retransmission centre was opened last year in Stockholm. The centre switches tele- ▶

The Kaknas television tower in Stockholm is Scandinavia's tallest building, and where one of Sweden's two Confravision studios is located.



The L. M. Ericsson 500-line selector, which is used in major telephone exchanges throughout Sweden.

Control room of an Ericsson multiprocessor stored program control telephone exchange.



A motorist makes a call from her car using the mobile telephone system operated by the Swedish Administration.

graph traffic automatically between Swedish telegraph offices and also between Sweden and other countries. Under the old system a large part of the telegraph traffic to and from other countries had to be retransmitted by manual methods.

As far as telex is concerned there are now about 9,000 connections, and this figure is growing at a rate of eight per cent a year. The national call rate averages 2,000 units per connection annually.

In parallel with telex expansion the Administration has had to cope with huge growth in the data transmission field. So far this has been met by using private circuits and the public telephone network giving transmission speeds from 200 to 4,800 bit/s. With data traffic increasing at the rate of 50 per cent a year and with more than 3,000 modems now in use, a separate data network has had to be considered. The result has been a small trial network between Stockholm, Gothenburg and Malmo and it is hoped to use the experience gained from this trial to establish a permanent national data transmission network towards the end of the 1970s.

Although it is not expected that video telephones will be used commercially in Sweden until the 1980s, a field trial of a system manufactured by L. M. Ericsson is currently taking place at the Administration Headquarters. The push-button telephone, however, has passed this stage and is being installed in customers' premises. It is expected that many of the existing dial telephones will have been replaced by the push-button variety by 1980.

Sweden is also developing Confravision, the conference by television service, in close co-operation with the British Post Office and other European Administrations. Last year an inaugural call was made between studios in London and Stockholm when senior Post Office officials talked for an hour to their Swedish counterparts. Since then a new studio has been opened in Malmo and contact can now be made between any of the five studios in Britain and the two in Sweden.

The Administration's radio branch is mainly concerned with the distribution of television and radio programmes. It broadcasts television through 205 VHF stations and 111 UHF stations and radio through its 36 AM and 86 FM stations to almost the total population. The branch is currently gearing itself to meet the growing demand for mobile telephone traffic. A country-wide telephone system to and from cars is envisaged as an extension to the current system which covers only densely populated areas. Present coverage is given by the use of 30 base stations which serve 1,500 customers. An automatic system for the interchange of telex traffic with ships has also recently been brought into service.

Radio paging is now on a trial to 500 customers, using a channel of the existing FM broadcasting network outside the ordinary programme channel. In one application paging signals are sent to a pocket-sized code receiver carried by the wanted person who then telephones a pre-arranged number to contact the caller. The radio paging system will eventually cover the whole of Sweden.

The Administration controls or jointly controls three companies which are related to its telecommunications activities. The Industrial Department and its subsidiary company Telefabrikation AB supply the Administration with crossbar exchange equipment, PABXs, telex and telephone equipment. Swedtel, a company wholly owned by the Administration, was formed in 1965 to carry out consultancy work in the field of telecommunications mainly in developing countries. Ellemtel, mentioned earlier, was formed in 1970 to undertake development work ordered by the joint owners (the Administration and L. M. Ericsson) and thus eliminated much duplication of effort which had previously been taking place.

It is probably doubtful whether even the people who made the 500-line selector and crossbar decisions more than 50 years ago fully anticipated the significance of their action, and there was much good fortune attached to reaching the coaxial age at the right time. The fact remains, however, that the Swedish Telecommunications Administration now provides a comprehensive service which is extensively praised by the Swedish people.

PO Telecommunications Journal, Spring 1975

Field trials of this picture telephone began in 1971 and are continuing so that its usefulness can be thoroughly evaluated.

Technical and traffic supervision of the Atesto computer-controlled telegram retransmission system is carried out at the control room in Stockholm.

MISCELLANY

High capacity link

The latest high capacity cable linking Britain and mainland Europe has now come into service as part of the major Post Office scheme to double communication links with the Continent by 1978.

The new cable, stretching 164 km between Broadstairs and Domburg on the Dutch coast, can carry up to 1,380 telephone calls simultaneously. Under the expansion plan four new high capacity cables (to Belgium, Denmark, Germany and the Netherlands) have been brought into service in the past five years together with extra cross-channel circuits built into the UK–France microwave radio hop. Together these have brought the number of telephone circuits between Britain and continental Europe to about 12,000 – compared with 5,000 five years ago.

Bringing the UK–Netherlands cable into service is the latest move in the Post Office's ongoing programme to boost links with the Continent. This programme provides for the addition of nearly 14,000 circuits between 1975 and 1978. The new cable is the first 23 supergroup system to be used across the North Sea and the total cost – about £1·4 million – has been financed jointly by the telephone administrations of Britain, the Netherlands and Germany.

Network grows

Nearly 12½ million exchange lines were in service in Britain's telephone network by the end of 1974 compared with 11,647,000 at the end of 1973. There are now 9,332,000 residential lines – against 8,596,000 a year ago – and 3,167,000 business lines compared with 3,051,000.

In the three months ended 31 December last, Britain's telephone users made more than 578 million trunk calls. This is an increase of nearly seven per cent on the same quarter of the previous year.

Wider Confravision

Confravision, the time- and energy-saving conference by television service operated by the Post Office is now available between five cities in Britain, two in Sweden and, from May, two in the Netherlands.

A market trial service between the UK and the first studio in the Netherlands began earlier this year when leading officials of the Post Office and the Netherlands PTT held a one-hour conference.

A market trial Confravision service between the UK and Stockholm has been in operation since May last year and in January the Swedish Administration opened a second studio in Malmo.

Telephone double

With 20 million telephones now in service in Britain, London's five-millionth 'phone was presented to The Samaritans by Sir Edward Fennessy, Deputy Chairman of the Post Office and Managing Director Telecommunications.

A specially inscribed telephone, London's five millionth and the 20 millionth in the country, is presented by Sir Edward Fennessy, right, to the Reverend Chad Varah, founder of The Samaritans. (See "Telephone double")

Sir Edward handed the telephone to the Reverend Chad Varah, founder of The Samaritans, at Fleet Building in the City of London where he was able to use the instrument to speak to Miss Monica Dickens, well-known author, who is Chairman of the Boston, USA, branch of The Samaritans.

"Since the Post Office became a public corporation in October 1969," Sir Edward said, "the number of telephones in use in this country has gone up from 13 million to 20 million. Inland telephone calls have risen by more than 70 per cent and international calls have more than doubled."

Vacation school

"Switching and Signalling in Telecommunication Networks" is the title of a vacation school, organised by the Electronics Division of the Institution of Electrical Engineers, which will take place at the University of Aston, Birmingham from September 10 to 17. It will provide an appreciation of overall strategies for the development, planning, and implementation of national telephone networks, particularly the associated switching systems. The school is primarily intended for those engaged in telecommunications engineering in either operating or manufacturing organisations.

Woolworth's sign on

F. W. Woolworth and Co. Ltd. is to take part in the Post Office's Experimental Packet Switched Service (EPSS), due to open this autumn. The first retail firm to join the project, Woolworth's participation brings the number of customers for the service to 38.

The firm plans to use EPSS for some of its commercial applications, including bulk data transfer and transmission of inventory statements from regional offices.

The number of computer hardware manufacturers directly taking part in the experiment has increased to seven with the decision of Control Data Corporation to participate. The others are British Olivetti, Burroughs, ICI, Univac and Ferranti, the firm which is also supplying the Argus 700E computers to be used for packet switching exchanges and network monitoring. Although IBM is not taking part directly, it has offered full technical backing for its customers who participate.

CTO site plans

The Post Office has applied for planning permission to build office accommodation and a telex switching centre on the site of the old Central Telegraph Office on the corner of St Martins-le-Grand and Newgate Street in London.

An office development permit has been granted and clearance of the site is now in progress to allow adequate time for archaelogical exploration. Subject to planning permission from the City of London, building work is expected to start next year and will take about five years to complete. The new building will house nearly 2,000 Post Office Headquarters staff.

Appointments

Sir Edward Fennessy has been appointed Deputy Chairman of the Post Office as well as continuing as Managing Director Telecommunications.

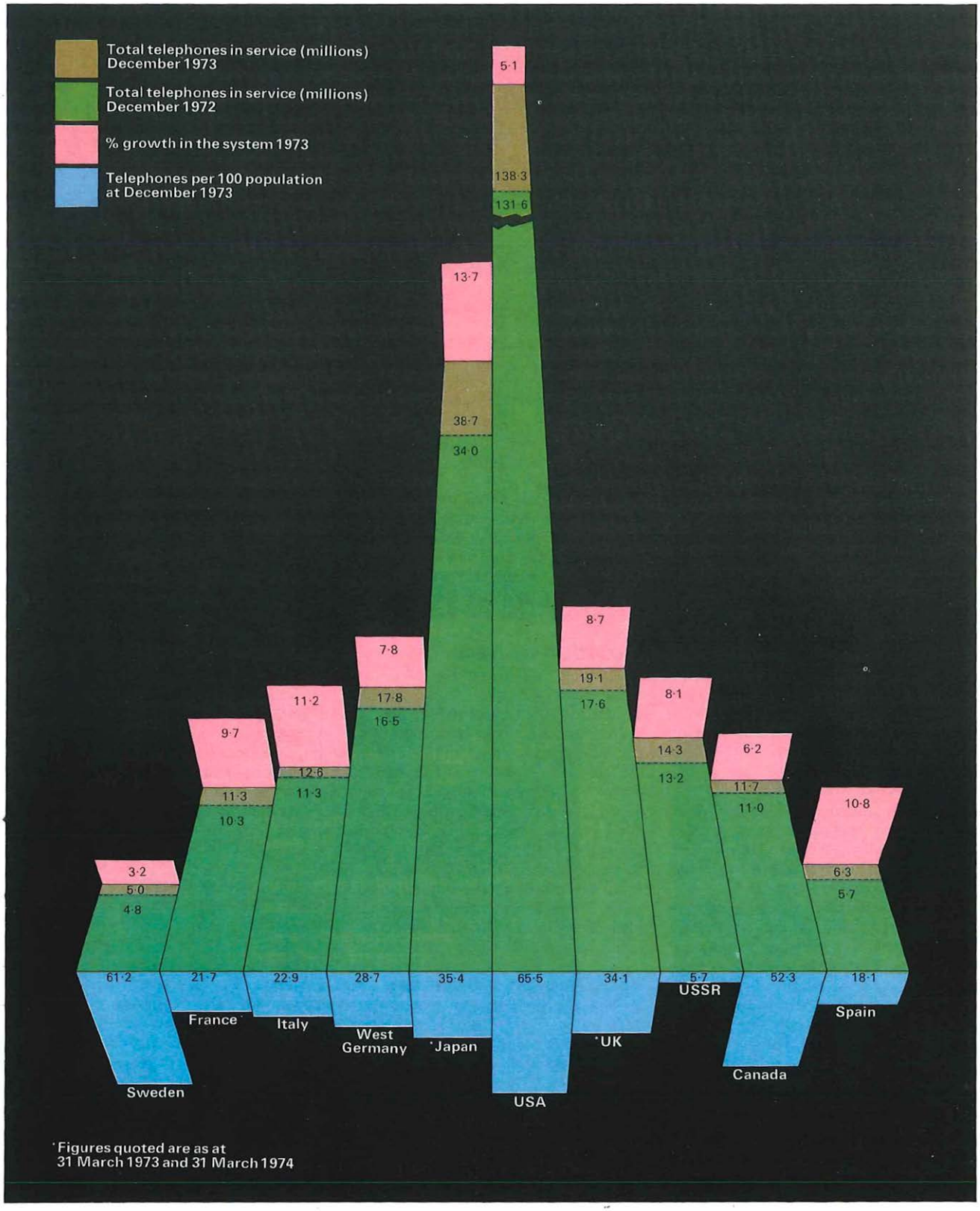
Mr K. H. Cadbury, Senior Director Planning and Purchasing in Post Office Telecommunications, has become Assistant Managing Director Telecommunications while **Mr J. M. Harper,** Director of Purchasing and Supply, has taken over Mr Cadbury's former job.

Mr D. P. Wratten, Senior Director Data Processing, has become Senior Director Telecommunications Personnel; **Mr R. Martin,** Director Telecommunications

(Turn to page 34)

Telephones around the world

Here are our annual international comparison of telecommunications statistics. They show countries with the highest number of telephones, and for the first time we include figures to indicate the percentage growth in their systems over the previous year.
The source of the figures is the American Telephone and Telegraph Company.



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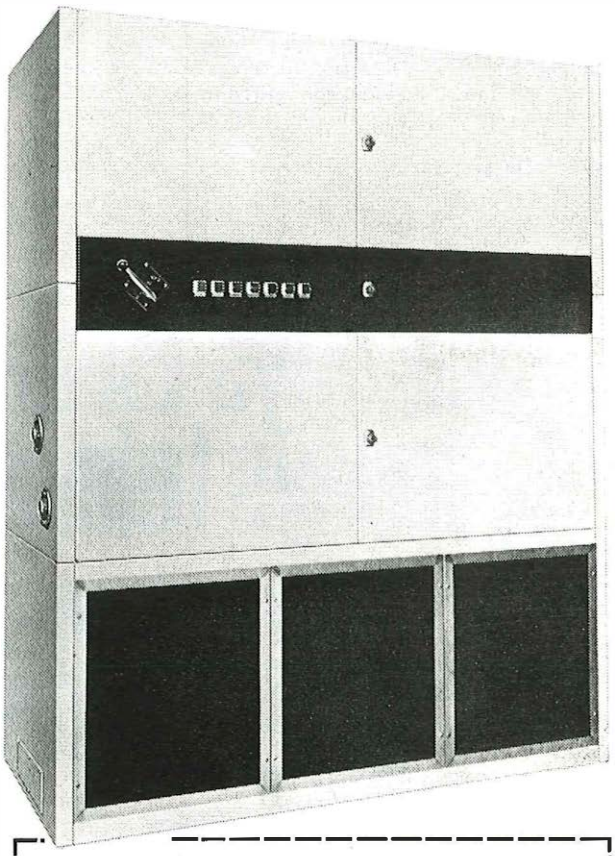

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Marketing, has become Senior Director Customer Services; **Mr J. Hodgson,** Director External Telecommunications, has become Senior Director, External Telecommunications and **Mr T. Southerton,** Senior Director Telecommunications Personnel, has become Senior Director Data Processing.

Mr C. May, who has been mainly concerned with developing new telephone switching systems throughout his career, is to be the Post Office's new Director of Research. He takes up his new post on 1 June on the retirement of Mr J. Bray.

Mr F. G. Phillips, has been appointed Director of Telecommunications Marketing in succession to Mr R. Martin. In his new job Mr Phillips, chairman of the editorial Board of Telecommunications Journal, is responsible for sales, installation, and marketing policy.

Mr T. F. A. Urben, Deputy Director of Service at Telecommunications Headquarters, has been appointed Director, South Western Telecommunications Region in succession to Mr R. E. Jordan.

Captain D. Chisholm has been appointed head of Telecommunications Headquarters' Marine Division in succession to Captain I. Finlayson who retired in March after 36 years with the Post Office.

Datel links up

The number of Datel connections sending and receiving computer data in the Post Office's data transmission services rose by nearly seven per cent in the six months to January 1975. There were 33,399 Datel terminals in service compared with 31,252 at the end of July 1974.

A third international Datel service is now available to Denmark. The new service, International Datel 200, gives simultaneous bothway transmission of serial binary data at up to 200 bit/s using the public telephone network. The other services, International Datel 100 (operated over the auto telex network) and International Datel 600 (using the public telephone service) have been available to Denmark for a number of years.

Three more countries

Three more countries have established automatic telex services with Britain, bringing the total using this facility to 72. Latest countries to go automatic are Bermuda, Bahrain and Sudan. Currently there are about 53,000 British users of telex – the public teleprinter service run by the Post Office.

Contracts

Private telephone exchange equipment worth nearly £1·8 million has been ordered by the Post Office from the Private Systems Division of GEC Telecommunications Ltd. The orders, which include selectors and relays for PABX switching, cover PABX 3 private automatic branch exchanges which will be installed in various Government Departments including Gamecock Barracks, RAF Farnborough, the Computer Centre in Norwich, and various offices of the Department of health and Social Security. GEC have also received more than £1 million-worth of orders from the Post Office for microwave-radio equipment to expand the telecommunications network in Scotland and to establish high-capacity trunk routes to the Post Office tropospheric scatter radio station on South Shetland which will serve the North Sea oil operations.

New size directories

Britain's first metric size telephone directory will be published next January. Listing subscribers in the Bristol Telephone Area, the directory will be in the international metric-based paper size known as A4. Directories in the new size for other Areas will follow during 1976 and 1977.

Measuring 210 mm wide by 297 mm tall, the new directories will be the same width as most existing telephone books but 21 mm taller, which will enable the Post Office to fit an extra 30 entries on each page. The change in size will provide savings in production costs and enable the Post Office to defer having to split large directories into two or more volumes.

In preparation for the change, new stiff plastic directory holders which will take both existing and A4-size volumes are now on sale. The holders are available in green, red, light blue and dark blue and in three spine widths.

Publication and Price:
The Journal is published in January, April, July and October, price 12p per issue. The annual postal subscription is 80p – 48p (or life subscription of £4) for retired Post Office staff.

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Contributions:
The Editorial Board will be glad to consider articles of general interest in the telecommunications field. No guarantee of publication can be given. The ideal length of such articles is between 1,000 and 2,000 words. The views of contributors are not necessarily those of the Board or of the Post Office.

Correspondence:
Communications should be addressed to the Editor, Post Office Telecommunications Journal, Public Relations Department, Post Office Central Headquarters, 23 Howland St., LONDON W1P 6HQ. Telephone: 01-631 2191 (editorial), 2193 (sales). Remittances should be made payable to "The Post Office" and should be crossed "& Co.". The Giro account number is 535-1006.

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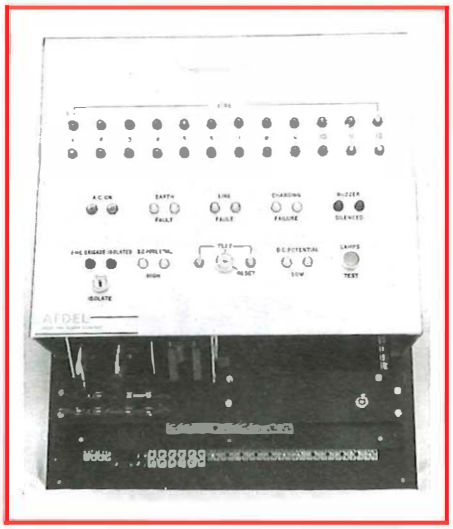

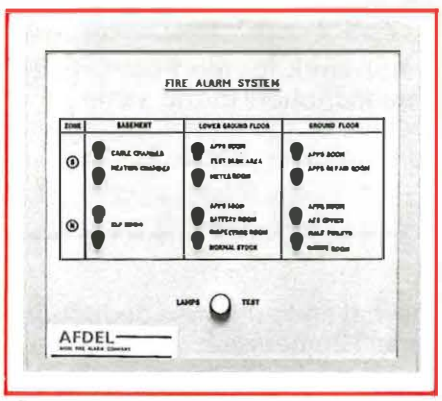

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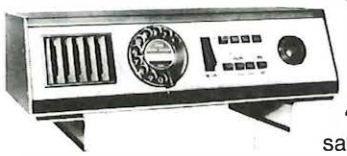

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The Prize — which honors the memory of Lars Magnus Ericsson, founder of the Company — will be awarded every third year. The Prize will be presented for the first time in May, 1976 in connection with the celebration of the Company's 100th anniversary.

The LM Ericsson Prize will be awarded in recognition of "an especially important scientific or technological contribution within telecommunications engineering" during the preceding three-year period — or in recognition of an earlier contribution whose importance has been established during the period.

The winner of the Prize will be selected by an independent Prize Committee whose members will be appointed by the Royal Swedish Academy of Engineering Sciences, the Board of Directors of the Swedish Telecommunications Administration and distinguished representatives of the universities of technology in Sweden.

Candidates may be nominated by members of the Prize Committee and by organizations and individuals who are active in the telecommunications sector.

All nominations must be made in writing. They should be accompanied by appropriate supporting material and must be received by the Prize Committee in Stockholm not later than October 1, 1975.

The Prize Committee reserves the right to invite qualified experts to participate in its deliberations. Such experts may not, however, participate in the voting for a Prize winner. Names of candidates nominated and the deliberations and voting of the Prize Committee will not be published or otherwise disclosed.

If a Prize-winning contribution has resulted from the work of two or three persons, the Prize may be awarded to such persons jointly.

The winner will receive the Prize on May 5 — the birthdate of Lars Magnus Ericsson — of each award year. On that occasion, the Prize winner will be expected to deliver an address related to telecommunications engineering.

Copies of the complete statutes governing the award of the LM Ericsson International Prize may be obtained from the Prize Committee.

Inquiries and nomination of candidates should be addressed to

The LM Ericsson Prize Committee

S-126 25 Stockholm, Sweden.

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